Portland Pedestrian Design Guide

City of Portland
Office of Transportation
Engineering and Development
Pedestrian Transportation Program

The

Portland Pedestrian Design Guide

is an element of the
Pedestrian Master Plan for the City of Portland, Oregon

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"Think globally, walk locally."

June, 1998 • Second printing October, 1998

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The Portland Pedestrian Design Guide

Introduction

THE PURPOSE OF THE *PEDESTRIAN DESIGN GUIDE*

The public right-of-way houses many transportation activities, including walking, bicycling, transit, freight movement, and automobile travel. It harbors the hardware, such as traffic signals and street lights, that supports those activities. In many cases the right-of-way also contains public utilities.

Each of these functions has specific design needs and constraints. The variety of functions is administered by people in several agencies, both inside and outside the City of Portland. In the past, conflicts between the design needs of competing functions occasionally have produced conditions that discourage pedestrian travel.

The purpose of Portland's *Pedestrian Design Guide* is to integrate the wide range of design criteria and practices into a coherent set of new standards and guidelines that, over time, will promote an environment conducive to walking.

Good pedestrian design encourages walking.

DEVELOPING THE GUIDELINES

The guidelines in the *Pedestrian Design Guide* were developed through a consensus-building process involving participation by each of the programs and agencies responsible for the form and function of the right-of-way.

The initial task of assessing and documenting existing practices and organizing the first draft of the guidelines was undertaken in 1995 with the assistance of a consultant team. This was followed by a lengthy process of revision and refinement, advised by a Technical Advisory Committee and a dedicated citizens' working group. The section on alternative pathways was developed through a parallel process with a different consultant. The final set of guidelines in this design guide represents a thorough analysis and integration of many practices.

Throughout, the guidelines attempt to balance pedestrian needs with the design needs and constraints of each of the other uses of the right-of-way. In a few cases this balance resulted in

Many uses of the right-of-way must be balanced.

guidelines that maintain the quality of the overall system but may be less than the ideal for pedestrians.

Regulations and Controls

In many cases, the practices that are covered by these guidelines are also the subject of other regulations or codes. This document attempts to knit together these disparate requirements.

A prominent example is the Americans with Disabilities Act (ADA) of 1990, for which there are stringent guidelines. Passage of the ADA marked a new era of responsibility for both public and private agencies, who must ensure that all users have access to all services and facilities. The guidelines for the ADA include the minimum dimensions required to achieve that access. In many cases, the guidelines in the Pedestrian Design Guide go beyond the minimum requirements of ADA to promote the vision of a pedestrian network for Portland that is not only accessible but safe, convenient, and attractive.

The City Code, which includes the zoning code, the traffic code, and the public improvements code, contains language regulating some elements. State laws and rules regulate others. Some Standard Construction Specifications, issued by the City Engineer for Portland, apply to the pedestrian realm.

Finally, there are numerous guidelines issued by various national organizations that constitute the canon of standard engineering practice.

Implementing the Guidelines

The *Portland Pedestrian Design Guide* is issued by the City Engineer. Every project that is designed and built in the City of Portland should conform to these guidelines.

Site conditions and circumstances often make applying a specific solution difficult. The *Pedestrian Design Guide* should reduce the need for ad hoc decisions by providing a published set of guidelines that are applicable to most situations. Throughout the guidelines, however, care has been taken to provide flexibility to the designer so that she or he can tailor the standards to unique circumstances. Even when the specific guideline cannot be met, the designer should attempt to

continued on p. 4

Principles for Pedestrian Design

The following design principles represent a set of ideals which should be incorporated, to some degree, into every pedestrian improvement. They are ordered roughly in terms of relative importance.

1. ***The pedestrian environment should be safe.***
   Sidewalks, pathways and crossings should be designed and built to be free of hazards and to minimize conflicts with external factors such as noise, vehicular traffic and protruding architectural elements.

2. ***The pedestrian network should be accessible to all.***
   Sidewalks, pathways and crosswalks should ensure the mobility of all users by accommodating the needs of people regardless of age or ability.

3. ***The pedestrian network should connect to places people want to go.***
   The pedestrian network should provide a continuous direct routes and convenient connections between destinations, including homes, schools, shopping areas, public services, recreational opportunities and transit.

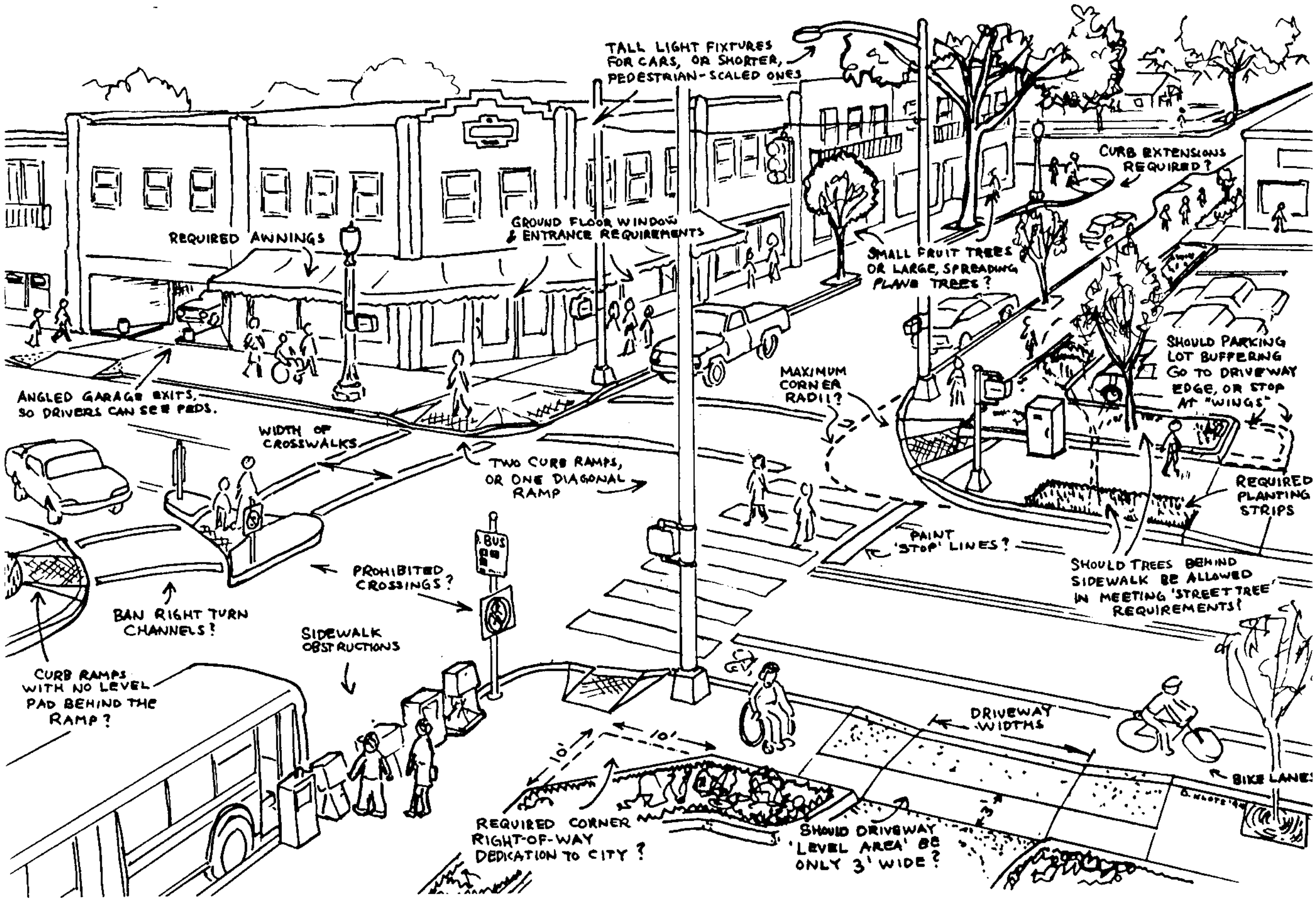
4. ***The pedestrian environment should be easy to use.***
   Sidewalks, pathways and crossings should be designed so people can easily find a direct route to a destination and delays are minimized.

5. ***The pedestrian environment should provide good places.***
   Good design should enhance the look and feel of the pedestrian environment. The pedestrian environment includes open spaces such as plazas, courtyards, and squares, as well as the building facades that give shape to the space of the street. Amenities such as street furniture, banners, art, plantings and special paving, along with historical elements and cultural references, should promote a sense of place.

6. ***The pedestrian environment should be used for many things.***
   The pedestrian environment should be a place where public activities are encouraged. Commercial activities such as dining, vending and advertising may be permitted when they do not interfere with safety and accessibility.

7. ***Pedestrian improvements should be economical.***
   Pedestrian improvements should be designed to achieve the maximum benefit for their cost, including initial cost and maintenance cost as well as reduced reliance on more expensive modes of transportation. Where possible, improvements in the right-of-way should stimulate, reinforce and connect with adjacent private improvements.

The pedestrian environment should provide good places.



Sketch by Doug Klotz, a volunteer on the citizens working group, illustrating many of the issues and questions about pedestrian design raised during the process of developing the guidelines.

find the solution that best meets the pedestrian design principles described on the previous page.

It is expected that some refinements will be made to these guidelines over time, as they are implemented and field-tested. With the three-ring format, modifications can be made as needed. To facilitate keeping the Guide up-to-date, every page has been dated.

A Note on the Use of English and Metric Units

Throughout the Pedestrian Design Guide, measurements have been given in metric units followed by English units in parentheses. The City of Portland is conducting a "soft" transition to metric units, in which new designs are being implemented that use convenient metric measurements rather than precise conversions from the traditional English units. As a consequence, the metric and English units given throughout this Guide are often not equivalent. For metric projects, the metric units should be used; for projects measured in English units, the English units will govern.

Guidelines for Sidewalk Corridors

Section A

A1 Introduction

The Sidewalk Corridor is the portion of the pedestrian system from the edge of the roadway to the edge of the right-of-way, generally along the sides of streets, between street corners. The Sidewalk Corridor functions to provide an environment for walking that is separated from vehicle movement.

Two people walking together should leave room for a third person to pass.

A1.1 Attributes of Good Sidewalk Corridors

Accessibility — *The Sidewalk Corridor should be easily accessible to all users, whatever their level of ability.*

Adequate Travel Width — *In most areas, two people walking together should be able to pass a third person comfortably, and different walking speeds should be possible. In areas of intense pedestrian use, sidewalks should be wider to accommodate the greater volume of walkers.*

Safety — *Sidewalk Corridors should allow pedestrians to feel a sense of safety and predictability. Sidewalk users should not feel threatened by adjacent traffic.*

Continuity — *The walking route along a Sidewalk Corridor should be obvious and should not require pedestrians to travel out of their way unnecessarily.*

Landscaping — *Plantings and street trees in the Sidewalk Corridor should create desirable microclimates and should contribute to the psychological and visual comfort of sidewalk users.*

Social Space — *Sidewalk Corridors should provide places for people to interact. There should be places for standing, visiting, and sitting. The Sidewalk Corridor should be a place where children can safely participate in public life.*

Quality of Place — *Sidewalk Corridors should contribute to the character of neighborhoods and business districts, and strengthen their identity.*

Sidewalk Corridors should provide places for interaction between people.

A1.2 Legal Aspects of the Sidewalk Corridor

A1.2a Sidewalk Corridors and the Code of the City of Portland

"Sidewalk" is defined in Titles 16 and 17 of the City's Code, and the definitions are slightly different. In Title 16, the term refers to the area between the curb or roadway edge and the property line, whether or not it is improved.[1] In Title 17, the term is used to refer to the sidewalk improvement itself.[2]

Under Chapter 17.28, responsibility for the construction, reconstruction, and repair of the sidewalk, as well as liability for any damages or injuries resulting from defective conditions, is assigned to the adjacent property owner.[3] Authority is delegated to the City Engineer to require the repair or construction of the sidewalk where it is needed.[4]

The Sidewalk Corridor is the area between the edge of the roadway and the property line. Construction and maintenance of the sidewalk is the responsibility of the adjacent property owner. In earlier times, the concrete sidewalk was often constructed before the street was paved.

In Title 18, Chapter 18.03, Nuisance Abatement, notes the adjacent property owner's responsibility for ensuring that the sidewalk is kept clear of debris and projecting bushes and limbs.[5]

Chapters 17.25 and 17.26 spell out the regulations for sidewalk cafes and sidewalk vendors. Such uses must leave a 1.8 m (6'-0") clear width for the Through Pedestrian Zone.

A1.2b Sidewalk Corridors and the Americans with Disabilities Act (ADA)

The design of improvements within the Sidewalk Corridor is covered by the ADA Interim Final Rule for State and Local Government Facilities[6] issued by the Architectural and Transportation Barriers Compliance Board on June 20, 1994. At the time of printing these guidelines, this rule has not yet been adopted in final form by the U.S. Department of Justice.

Selected key provisions of the interim final rule as they affect improvements in the public right-of-way are

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[1] Code of the City of Portland, Title 16, Vehicles and Traffic; 16.90.330, Sidewalk.

[2] Code of the City of Portland, Title 17, Public Improvements; 17.28.010, Sidewalk Defined.

[3] Ibid., 17.28.020, Responsibility for Sidewalks and Curbs.

[4] Ibid., 17.28.030, Notice for Construction of Sidewalks and Curbs.

[5] Code of the City of Portland, Title 18, Nuisance Abatement and Noise Control, 18.03.050, Property Maintenance.

[6] Federal Register, Vol. 59, No 121. Architectural and Transportation Barriers Compliance Board; 36 CFR Part 1191.

- minimum clear passage of 915 mm (3'-0") required
- no limit on running slope or requirement of intermediate landings for a public sidewalk when it follows the grade of the street
- maximum cross-slope for the sidewalk of 1:50 (at least within the minimum clear passage width)

For the complete requirements, consult the ADA Accessibility Guidelines for Buildings and Facilities, Section 14: Public Rights-of-Way.

A2 Required Sidewalk Improvements

A2.1 Construction of New Streets in New Rights-of-Way

All construction of new public streets will include sidewalk improvements on both sides.

Exception:

For new streets, provision of a sidewalk improvement on only one side will be considered under the following conditions:

- right-of-way has severe topographic or natural resource constraints; or
- street is a cul-de-sac with four or fewer dwelling units.

A2.2 Street Improvements to Existing Rights-of-Way

All improvements to existing streets will include sidewalk construction. Street improvements will be provided with sidewalk improvements on both sides of all streets in Pedestrian Districts and on all City Walkways, and on both sides of most Local Service Walkways.[7]

When the existing right-of-way is too narrow to accommodate both street and sidewalk improvements, the following steps to allow room for a sidewalk improvement should be pursued:

- acquire additional Right-of-Way or Public Walkway Easement
- narrow existing roadway in accord with established minimum roadway standards

A new sidewalk constructed as part of a Local Improvement District project.

[7] Pedestrian Districts, City Walkways, and Local Service Walkways are street classifications for pedestrian use in the Transportation Element of Portland's Comprehensive Plan.

Exceptions:

For improvements to existing street rights-of-way in Pedestrian Districts and on City Walkways, approval for a sidewalk on only one side will be considered under the following conditions:

- right-of-way has severe topographic or natural resource constraints

For improvements to existing street rights-of-way on Local Service Walkways, approval for a sidewalk on only one side only will be considered under the following conditions:

- right-of-way has topographic or natural resource constraints; or
- right-of-way has existing development or mature landscaping constraints; or
- street is a cul-de-sac with fewer than 20 dwelling units.

For improvements to existing street rights-of-way on Local Service Walkways, approval for providing no sidewalk will be considered under the following condition:

- right-of-way has very severe topographic or natural resource constraints

A2.3 Frontage Improvements on Existing Streets

Sidewalk improvements will be required as part of all new infill building development on existing streets, to the extent practicable.

Where the existing road has no curb or is otherwise substandard and it is not practicable to construct full street improvements for a limited street segment, the City Engineer may require an interim path to be constructed.

Exceptions:

A waiver of remonstrance, covenant or other legal agreement may be accepted in lieu of immediate sidewalk construction under the following conditions:

- the existing road has no curb or is otherwise substandard and it is not practicable to construct full street improvements or an interim path for a limited street segment; or
- infill development of single-family residential use is proposed for three or fewer contiguous lots where the majority of lots on the block have already been developed and

New sidewalk constructed as part of an infill redevelopment project.

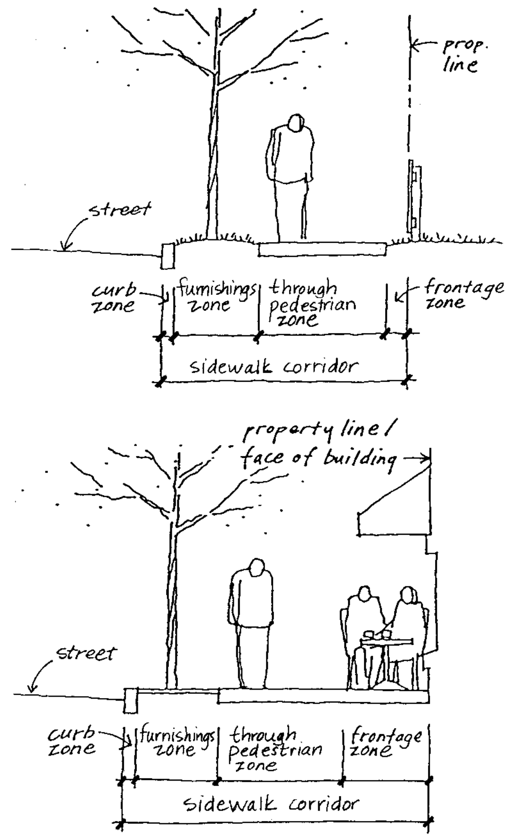
there is no pattern of existing sidewalk improvements in the area.

A3 Designing and Implementing Sidewalk Corridor Improvements

A3.1 Zones in the Sidewalk Corridor

The Sidewalk Corridor is typically located within the public right-of-way between the curb or roadway edge and the property line. The Sidewalk Corridor contains four distinct zones: the ***Curb Zone***, the ***Furnishings Zone***, the ***Through Pedestrian Zone***, and the ***Frontage Zone***.

Each of these four zones is discussed in detail in the sections that follow. Table A-1 provides guidelines for recommended widths of these zones under various street conditions.



Typical sections of Sidewalk Corridor in residential zone, top, and commercial zone, bottom sketch.

A3.1a Constraints in the Sidewalk Corridor

Most of Portland's street system has already been built, and in many cases the existing Sidewalk Corridor is too narrow to accommodate the recommended zone widths. Competing needs for space in a constrained Sidewalk Corridor can be resolved in either of two ways: by compromising on the minimum required clearance for some or all of the zone or by increasing the dimensions of the Sidewalk Corridor.

The resolution of such conflicts in any given case must be based on considerations of balancing the conflicting uses and adjusting the magnitude of the solution to fit the magnitude of the project.

Table A-1, on p. A-12, shows two constrained Sidewalk Corridor conditions that are commonly encountered on existing streets and gives the recommended zone widths for these conditions. In addition, Table A-2, beginning on p. A-14, gives siting criteria for many individual elements normally located within the Sidewalk Corridor of the right-of-way, such as utility poles, signals, signs, etc., with suggested contingency measures where siting criteria cannot be met.

A3.1b Widening the Sidewalk Corridor

In some cases, it is possible to increase the dimensions of the Sidewalk Corridor, either through acquisition of right-of-way or public walkway easements, or by reallocation of the overall right-of-way (such as by narrowing travel lanes or reducing the number of lanes). As part of a roadway reconstruction project on a street with a narrow Sidewalk Corridor, the project planners should first analyze the impact of reclaiming a portion of the existing right-of-way. If this proves impractical, the feasibility of acquiring additional right-of-way should be examined. Acquisition should be considered where its cost is reasonable in proportion to the overall project cost.

In the case of infill development, the dedication of public right-of-way or the granting of a public walkway easement to widen the Sidewalk Corridor may be included as a requirement for obtaining a building permit or land use approval.

A3.1c Vehicle Parking in the Sidewalk Corridor

Parking of motor vehicles is not permitted within the Sidewalk Corridor.[8] Bicycle parking is permitted only where it does not impede pedestrian uses (see Table A-2).

A3.1d Planting in the Sidewalk Corridor

Street trees are a highly desirable part of the pedestrian environment, especially large-canopied shade trees. Every effort should be made to provide enough room in the Sidewalk Corridor to accommodate trees in addition to pedestrian travel. Street trees are required by City Code for commercial construction projects with a value greater than $25,000.[9]

Large spreading street trees form a canopy that provides cool shade and a sense of enclosure for pedestrians.

Tree limbs and branches must be trimmed to leave 2.3 m (7'-6") clear above the level of the sidewalk.[10] Permanent planters usually are not permitted in the right-of-way. Moveable planters are permitted in the Frontage Zone under a permit from the City Engineer, and are limited to a projection of 450 mm (1'-6") into the right-of-way.[11]

Maintenance of plantings in the Sidewalk Corridor is the responsibility of the adjacent property owner.[12]

A3.2 The Curb Zone

Curbs prevent water in the street gutters from entering the pedestrian space, discourage vehicles from driving over the pedestrian area, and make it easy to sweep the streets. In addition, the curb helps to define the pedestrian environment within the streetscape, although other designs can be effective for this

[8] Code of the City of Portland, Title 16, Section 16.20.130
[9] Code of the City of Portland, Title 20, Sections 20.40.070 and 20.40.235
[10] Code of the City of Portland, Title 17, Section 17.52.010
[11] Title 17.52.050
[12] Title 18.03.050, Property Maintenance

purpose. At the corner, the curb is an important tactile element for pedestrians who are finding their way with the use of a cane.

Unless specified otherwise for a special district, the curb should be 150 mm (0'-6") in width, 150 mm (0'-6") in height in residential areas, and 175 mm (0'-7") in height for commercial areas.[13] In order to prevent vehicular movement onto the sidewalk area, it is recommended that the curb height be no less than 100 mm (0'-4") following routine asphalt overlays of the street. An exception to this recommendation is at corners, where the landing height may be reduced in order to accommodate curb ramps.[14]

A3.3 The Furnishings Zone

The Furnishings Zone buffers pedestrians from the adjacent roadway, and is also the area where elements such as street trees, signal poles, utility poles, street lights, controller boxes, hydrants, signs, parking meters, driveway aprons, grates, hatch covers, and street furniture are properly located. This is the area where people alight from parked cars.

Wherever it is wide enough, the Furnishings Zone should include street trees. In commercial areas, this zone may be paved, with tree wells and planting pockets for trees, flowers and shrubs. In other areas, this zone generally is not paved except for access walkways, but is landscaped with some combination of street trees, shrubs, ground cover, lawn, or other landscaping treatments.

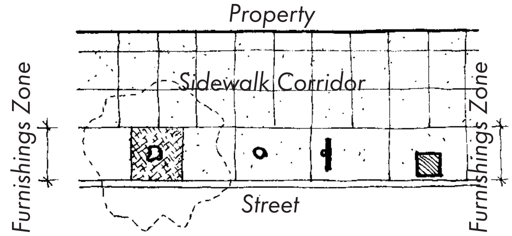
Separating pedestrians from travel lanes greatly increases their comfort as they use the Sidewalk Corridor. This buffer function of the Furnishings Zone is especially important on streets where traffic is heavy, yet along many of these streets the existing Sidewalk Corridor is narrow. Where possible, additional width should be given to this zone on streets with traffic speeds over 55 km/h (35 mph).

Vending carts may occupy a portion of the Furnishings Zone as permitted under Title 17.25 and 17.26.

The Furnishings Zone buffers pedestrians from the roadway and is the place for elements such as street trees, poles, parking meters and street furniture.

A3.3a Grates

All grates within the sidewalk shall be flush with the level of the surrounding sidewalk surface, and shall be located outside the Through Pedestrian Zone. Ventilation grates and tree well grates shall have openings no greater than 13 mm (0'-1/2") in width.[15]



Typical alignment of the Furnishings Zone within the Sidewalk Corridor

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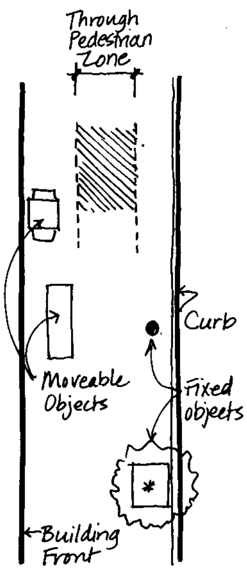
[13] Standard Plan Nos. 3-130, 3-131, 3-132
[14] See Section B2.5c, Recommended Landing Height at Corners

The Through Pedestrian Zone is the area of the sidewalk corridor intended for pedestrian travel.



Typical alignment of the Through Pedestrian Zone within the sidewalk corridor.

Without a Through Pedestrian Zone, the sidewalk corridor loses its essential function.

Tree well grates generally are required in the Central Business District, the Lloyd District, and in shopping areas. Designers should consider using tree well grates or treatments such as unit pavers in other areas of intense pedestrian use, such as Pedestrian Districts.

A3.3b Hatch Covers

Hatch covers should be located within the Furnishings Zone.[16] Hatch covers must have a surface texture that is rough, with a slightly raised pattern. The surface should be slip-resistant even when wet. The cover should be flush with the surrounding sidewalk surface.

A3.4 The Through Pedestrian Zone

The Through Pedestrian Zone is the area intended for pedestrian travel. This zone should be entirely free of permanent and temporary objects.

As a general rule, the zone should be at least 2.5 m (8'-0") in Pedestrian Districts, at least 1.9 m (6'-0") on City Walkways, and at least 1.5 m (5'-0") on Local Service Walkways (see Table A-1 for specific recommendations). For very high volume pedestrian areas, additional width should be provided.[17]

For sidewalk infill projects in areas with some existing sidewalks, the new sidewalk should match the existing width or meet the recommended width in Table A-1, whichever is larger.

Driveway aprons should not intrude into the Through Pedestrian Zone.[18]

A3.4a Surfaces

Walking surfaces shall be firm and stable, resistant to slipping, and allow for ease of passage by people using canes, wheelchairs, or other devices to assist mobility.

Sidewalks are generally constructed of Portland cement concrete. Unit pavers may also be used[19], particularly in the Furnishings Zone or around mature trees where sidewalk lifting is a problem.

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[15] Americans with Disabilities Act

[16] Title 24.65.010 calls for openings to be no closer than 600 mm (2'-0") to the curb and no closer than 900 mm (3'-0") to the property line

[17] See the formulas given in Chapter 13, "Pedestrians," of the *Highway Capacity Manual.*

[18] See Section A3.6, Driveways.

[19] Standard Plan Nos. 3-190, 3-191

For a discussion of these and other materials, see Appendix on Materials.

The surface of concrete sidewalks should be scored to match historic patterns within a neighborhood or district where appropriate.[20]

A3.4b Running Grade

While running grade for accessible routes on private property is limited to 1:20, or 1:12 for ramps, sidewalks in the public right-of-way (or public walkway easement) may be steeper than 1:20, provided they are no steeper than the adjacent roadway.

A3.4c Cross Slope

Walking surfaces should be relatively level. The preferred cross slope for the entire paved sidewalk corridor is 1:50. If a greater slope greater is anticipated because of unusual topographic or existing conditions, the designer should maintain the preferred slope of 1:50 within the entire Through Pedestrian Zone, if possible.

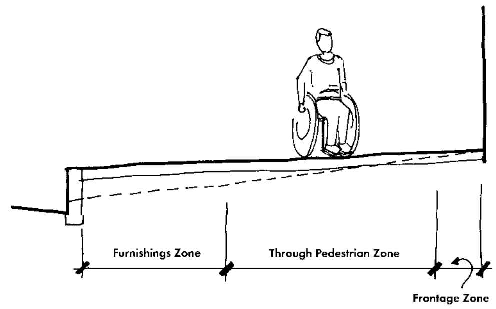
This can be accomplished either by raising the curb so that the cross-slope of the entire sidewalk can be 1:50, or by placing the more steeply angled slope within the Furnishings Zone and/or the Frontage Zone (see illustration).

If the above measures are not sufficient and additional slope is required to match grades, the cross slope within the Through Pedestrian Zone may be as much as 1:25, provided that a 900 mm (3'-0") wide portion within the Through Pedestrian Zone remains at 1:50 cross slope, as shown in the illustration.

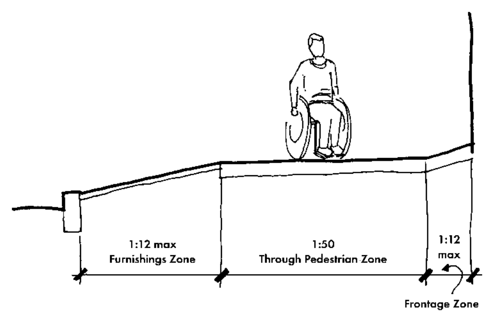
A3.5 The Frontage Zone

The Frontage Zone is the area between the Through Pedestrian Zone and the property line. This zone allows pedestrians a comfortable "shy" distance from the building fronts, in areas where buildings are at the lot line, or from elements such as fences and hedges on private property.

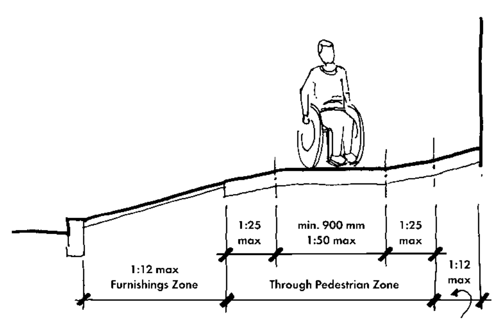
Where no Furnishings Zone exists, elements that would normally be sited in that zone, such as transit shelters and benches, telephone kiosks, signal and street lighting poles and controller boxes, traffic



Raising the curb is one approach to maintaining the preferred cross-slope.



The Furnishings Zone and the Frontage Zone may be sloped more steeply, provided the preferred cross-slope is maintained in the Through Pedestrian Zone.



If necessary, the Through Pedestrian Zone may contain slopes up to 1:25, provided a 900 mm (3'-0") wide area with a cross slope of no more than 1:50 is maintained within the zone.

[20] Standard Plan No. 3-125

Temporary uses such as sidewalk cafes may occupy the Frontage Zone, providing the Through Pedestrian Zone remains clear.

Elements such as standpipe systems may project into the Frontage Zone. Care must be taken to assure compliance with the ADA.

and parking signs, and utility poles, may occupy the Frontage Zone. In some cases, easements or additional right-of-way may be required to allow for these items. In some land-use zones, building to the right-of-way line is encouraged to provide a pedestrian-friendly streetscape. In these zones (which include CS, CM, CX, RX, and, on Transit Streets, CG and R-1) these elements should not be sited in the Frontage Zone, as they could block access to an existing or future building.

Private temporary uses such as sidewalk cafes (where allowed by Code[21]) may occupy the Frontage Zone, so long as the Through Pedestrian Zone is maintained.

A3.5a Encroachments

Elements such as stairs, stoops, rails, bay windows, awnings, canopies, overhangs, signs, flags, banners, marquees, cornices, brackets, fences, walls and planters must comply with the encroachment policies set out in the Uniform Building Code, Chapter 32. Such elements are subject to permit from the City Engineer.

Fences and walls, when permitted, must be at least 300 mm (1'-0") behind the back of the sidewalk (or the future sidewalk, if none exists). Encroachments into the right-of-way should not be permitted where the existing sidewalk corridor is less than the recommended width shown in Table A-1.

Elements such as standpipe systems for fire safety may project into the Frontage Zone from a building face a maximum of 300 mm (twelve inches) per the City Engineer, but not more than 100 mm (four inches) if they project in the area between 685 mm and 2030 mm (2’-3” and 6'-8”) above the sidewalk, per the ADA.

A3.5b Adjacent Parking Lots

In existing parking lots, where there is no landscaping between parked vehicles and the right-of-way, wheel stops or other means such as walls or fences should be used to prevent parked vehicles from overhanging into the Frontage Zone.

The Frontage Zone must be landscaped unless it is paved. In new parking lots where landscaping is required, landscaping in the public right-of-way will not count toward the minimum required landscaped area for the parking lot, which must be located on private property.

[21] Code of the City of Portland, Title 17, Chapters 17.25 and 17.26

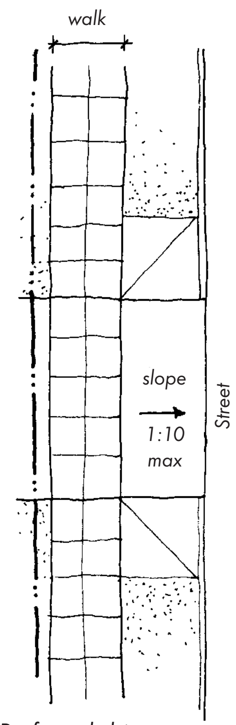
A3.6 Driveways

A3.6a Driveway Aprons

Wherever possible, driveway aprons should not intrude into the Through Pedestrian Zone.

A3.6b Preferred Driveway Condition in Sidewalk Corridors

In the preferred condition, the Through Pedestrian Zone is maintained at the sidewalk cross slope of 1:50 across the entire driveway, and is scored with a sidewalk pattern. The sloped portion of the driveway apron is located entirely within the Furnishings Zone and should be sloped to the maximum allowable slope of 1:10 to minimize the width of the sloped apron. Where necessary to keep the driveway apron slope from exceeding 1:10, the sidewalk may be partially dropped to meet the grade at the top of the apron. This is preferred to extending the sloped apron into the Through Pedestrian Zone.[22]

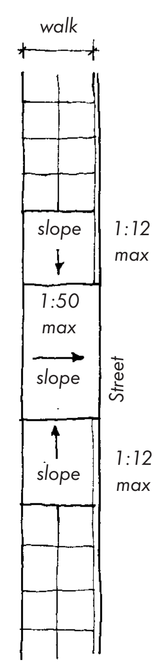


Preferred driveway condition

A3.6c Constrained Condition for Driveways in Sidewalk Corridors

In cases where sidewalk widths are too constrained for the preferred condition, a "dropped driveway" may be used to meet ADA requirements. Typically, this design will be appropriate only where the Sidewalk Corridor width is less than 2.4 m (8'-0"). The sidewalk scoring grid should be continued across the driveway in the Through Pedestrian Zone.[23]

An alternate approach to the constrained condition is to provide a bypass walk at the top of the driveway. However, as this results in a slight detour for the pedestrian, designers should consider this option only where there are problems with the dropped driveway, such as steep grades, or where the dropped driveway results in stormwater drainage problems like puddling or drainage onto private property.[24]



Dropped driveway in constrained width situation (scoring should continue across drive).

A3.6d No Pedestrian Signals on Sidewalks

Occasionally a driveway must be signalized. In such cases, the design treatment of the driveway apron should avoid the appearance of a continuation of the sidewalk. In general, pedestrians do not expect to be controlled by pedestrian signal indications on a sidewalk.

[22] See Standard Plans 3-103, 3-104, 3-105B, 3-106, and 3-107B.
[23] See Standard Plans 3-105A and 3-107A.
[24] See Standard Plans 3-105C and 3-107C.

Table A-1 Recommended Widths for Sidewalk Corridor Zones

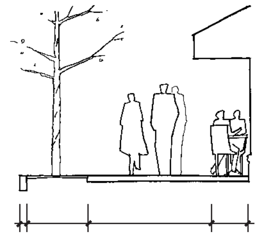
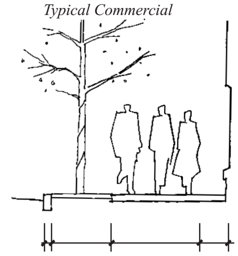
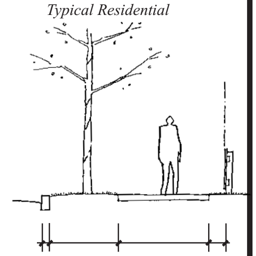
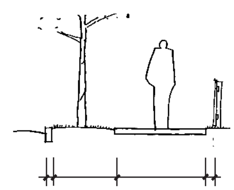
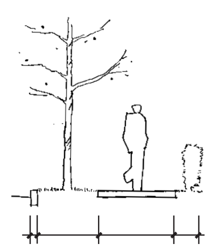
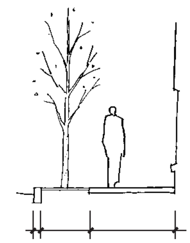
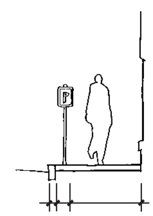
Sidewalk Corridor	Application	Recommended Configuration
4.6 m (15' - 0")	**Recommended** in Pedestrian Districts, especially for arterial streets or where ROW width is 24.5 m (80'-0").	 Curb Zone: 150 mm (0' - 6") Furnishings Zone: 1.2 m (4' - 0") Through Pedestrian Zone: 2.5 m (8' - 0") Frontage Zone: 750 mm (2' - 6")
3.7 m 12' - 0"	**Recommended** for City Walkways, for local streets in Pedestrian Districts, and for streets where ROW width is 18.2 m (60'-0").	*Typical Commercial*  *Typical Residential*  Curb Zone: 150 mm (0' - 6") Furnishings Zone: 1.2 m (4' - 0") Through Pedestrian Zone: 1.9 m (6' - 0") Frontage Zone: 450 mm (1' - 6")
3.4 m 11' - 0"	**Recommended** for Local Service Walkways where ROW width is 15.2 m (50'-0"). **Accepted** for City Walkways where ROW width is 15.2 m (50'-0") provided Through Pedestrian Zone is 1.9 m (6'-0").	 Curb Zone: 150 mm (0' - 6") Furnishings Zone: 1.2 m (4' - 0") Through Pedestrian Zone: 1.9 m (6' - 0") Frontage Zone: 150 mm (0' - 6")
3.0 m (10' - 0")	**Recommended** for Local Service Walkways in residential zones of R-7 or less dense where ROW width is less than 15.25 m (50'-0").	 Curb Zone: 150 mm (0' - 6") Furnishings Zone: 1.2 m (4' - 0") Through Pedestrian Zone: 1.5 m (5' - 0") Frontage Zone: 150 mm (0' - 6")

Table A-1 Recommended Widths for Sidewalk Corridor Zones, continued

<table>
<tr><th>Sidewalk Corridor</th><th>Application</th><th colspan="4">Recommended Configuration</th></tr>
<tr><td rowspan="3">2.7 m
(9' - 0")</td><td rowspan="3">NOT RECOMMENDED for new construction or reconstruction.
Accepted in existing constrained conditions when increasing the Sidewalk Corridor is not practicable.
Note: Minimum Sidewalk Corridor for placement of street trees. Street trees not allowed in Furnishing Zone less than 900 mm (3'-0").</td><td colspan="4"></td></tr>
<tr><td>Curb Zone</td><td>Furnishings Zone</td><td>Through Pedestrian Zone</td><td>Frontage Zone</td></tr>
<tr><td>150 mm
(0' - 6")</td><td>900 mm
(3' - 0")</td><td>1650 mm
(5' - 6")</td><td>0 m
(0' - 0")</td></tr>
<tr><td rowspan="2">less than
2.7 m
(9' - 0")</td><td rowspan="6">NOT RECOMMENDED.
Accepted in existing constrained conditions when increasing the Sidewalk Corridor width is not practicable.</td><td colspan="4"></td></tr>
<tr><td>Curb Zone</td><td>Furnishings Zone</td><td>Through Pedestrian Zone</td><td>Frontage Zone</td></tr>
<tr><td>2.4 m (8' - 0")</td><td rowspan="4">150 mm
(0' - 6")</td><td>600mm
(2' - 0")</td><td>1650 mm
(5' - 6")</td><td rowspan="4">0 m
(0' - 0")</td></tr>
<tr><td>2.1 m (7' - 0")</td><td>450mm
(1' - 6")</td><td>1500 mm
(5' - 0")</td></tr>
<tr><td>1.8 m (6' - 0")</td><td>300 mm
(1' - 0")</td><td>1350 mm
(4' - 6")</td></tr>
<tr><td>1.5 m (5' - 0")</td><td>0 m</td><td>1350 mm
(4' - 6")</td></tr>
</table>

Note: Metric and English units are not equivalent. Use metric units for metric projects and English units for English projects.

Table A-2. Elements in the Right-of-Way

Benches

Responsibility: permit by Street Systems Management, BTED.	**Footprint:** Maximum dimensions 750 mm (2'-6") wide by 2.4 m (8'-0") long
Reference: Title 17.44.030 -070	**Vertical Profile:** Maximum 1.05 m (3'-6") high

Siting Criteria: Located within Furnishings Zone when zone is greater than 900 mm (3'-0") wide, or within the Frontage Zone when zone is greater than 900 mm (3'-0"). Benches generally should face the Through Pedestrian Zone.

If the Siting Criteria can't be met, consider:
- Setting bench at back of walk on private property,

Bicycle Lockers:

Responsibility: Locations determined by Bicycle Program, BTM; permit by Street Systems Management, BTED; installation by BOM.	**Footprint:** 2 m long x 1.9m wide (6'-6" x 6'-4')
Reference: "Bicycle Parking Facilities Guideline," available from BTM.	**Vertical Profile:** requires 2.1 m (7 ft) vertical clearance

Siting Criteria: Located where there is enough room to leave a recommended clear maneuvering area of 2.7 m (9 ft) at the door of the llockers. Minimum clear maneuvering area is 1.8 m (6 ft), which may be within the Through Pedestrian Zone iat the discretion of the City Engineer.

If the Siting Criteria can't be met, consider:
- Placing locker on private property at back of walk

Bicycle Racks

Responsibility: Locations determined by Bicycle Program, BTM; permit by Street Systems Management, BTED; installation by BOM.	**Footprint:** (of typical "hitching post" rack) 750 mm (2'-6") long by 50 mm (0'-2") wide.
Reference: "Bicycle Parking Facilities Guideline," available from BTM.	**Vertical Profile:** 900 mm (3'-0") tall

Siting Criteria: Parallel to curb, 750 mm (2'-6") minimum from face of curb (900 mm [3'-0"] preferred when parking is adjacent to curb) with a minimum of 750 mm (1'-6") between the rack and the Through Pedestrian Zone (1.35 m [7'-6"] clear althogether). Where border width is less than 3.65 m (12'-0") but is 3.0 m (10'-0") or greater, rack may be sited at 600 mm (2'-0") from face of curb or aligned with centerline of Furnishings Zone. (3.0 m [10'-0"] is minimum border width for siting bicycle racks.)

If the Siting Criteria can't be met, consider:
- Aquiring R.O.W. or Public Walkway Easement at back of walk to bring Sidewalk Corridor width to 3.0 m (10'-0") and siting rack as above
- Setting rack at back of walk on private property or on acquired R.O.W. or easement,
- Creating a curb extension within the on-street parking lane, if present, for siting bicycle parking.

Controller Boxes, Irrigation

Responsibility: Portland Parks and Recreation	**Footprint:** Varies - 300 mm x 900 mm (1'-0"x 3'-0") typ.
Reference: Standard Specification 207.3.06	**Vertical Profile:** Flush with surface.

Siting Criteria: Centered within Furnishings Zone when zone is 900 mm (3'-0") wide or greater.

Table A-2. Elements in the Right-of-Way, continued

Controller Boxes, Signal

Responsibility: Bureau of Traffic Management	**Footprint:** 430 mm x 500 mm (1'-5" x 1'-8") to 600 mm x 750 mm (2'-0" x 2'-6")
Reference: Standard Construction Specifications section 310	**Vertical Profile:** 1.0 m (3'-4") tall, typically located on pole with top of box at about 1.75 m (5'-10")

Siting Criteria: Located on signal pole, sited so electrician can see the signals from the controller box, and parallel to walkway. Centered in Furnishings Zone when zone is 900 mm (3'-0") wide or greater.

If the Siting Criteria can't be met, consider:
- Placing at back of walk, on acquired R.O.W. or easement if necessary, provided there is no building there and zoning does not permit or require future builliding at the right-of-way line.
- Where a high speed travel lane adjacent to curb would make parallel mounting unsafe, cabinet may be mounted perpendicular to walkway provided maximum possible clearance for the Through Pedestrian Zone is maintained.

Drinking Fountains

Responsibility: Bureau of Water Works	**Footprint:** 300 mm (1'-0") diameter
Reference: Standard Plan 5-107 or 5-655	**Vertical Profile:** c. 600 mm (2'-0") tall

Siting Criteria: Located within Furnishings Zone.

Elevator Doors

Responsibility: Bureau of Buildings	**Footprint:** Varies
Reference: Title 24.65.030	**Vertical Profile:** Flush with sidewalk

Siting Criteria: Locate in Furnishings Zone if wide enough to accommodate.

If the Siting Criteria can't be met, consider:
- Elevator doors may encroach into through zone if minimum through zone clearance is maintained; elevator doors which encroach into Through Pedestrian Zone should have same surface coefficient of friction as adjacent sidewalk.

Fire Hydrants

Responsibility: Bureau of Water Works	**Footprint:** 300 mm (1'-0") diameter

Siting Criteria: Located within Furnishings Zone when zone is 1.2 m (4'-0") wide or greater. Located behind the sidewalk with a minimum of 1.8 m (6'-0") clear for the Through Pedestrian Zone for sidewalks adjacent to curb.

If the Siting Criteria can't be met, consider:
- Placing at back of walk, on acquired R.O.W. or easement if necessary, provided there is no building there and zoning does not permit or require future builliding at the right-of-way line.
- Locating hydrant in new curb extension

Grates, Tree

Responsibility: Urban Forestry Manager, Development Services Division	**Footprint:** 1.2 m x 1.2 m (4’-0” x 4’-0”) or 900 mm x 1.5 m (5’-0”)
Reference: Design Guide for Public Street Improv. p. 6-39	**Vertical Profile:** flush

Siting Criteria: Required in Central Business District, Lloyd District, and shopping areas. See also “Street Trees” entry.

Table A-2. Elements in the Right-of-Way, continued

Grates, Ventilation

Responsibility: Bureau of Buildings	**Footprint:** Varies
Siting Criteria: Must be on private property.	

Parking Meters

Responsibility: Bureau of Traffic Management	**Footprint:** Support 75 mm (0'-3") diameter, twin meter head 125 mm x 300 mm (0'-5" x 1'-0")
Reference: Title 16.20.400	**Vertical Profile:** Top of meter head typically 1.5 m (4'-11") above sidewalk level
Siting Criteria: Centerline of post 810 mm (2'-8") from face of curb, typically. May vary from 560 mm (1'-10") to 1.1. m (3'-8") based on sidewalk width. Post centered in Furnishings Zone by special agreement in Lloyd district. May be modified in District Plans.	
If the Siting Criteria can't be met, consider: • Move post as close to curb as possible (560 mm [1'-10"] minimum) to maintain Through Pedestrian Zone. • If sidewalk is less than 1.5 m (5'-0") wide, mount meters at back of walk or on building face.	

Planters

Responsibility: Street Systems Management (for permitting private planters in ROW); Tri-Met (on Transit Mall)	**Footprint:** Varies
Siting Criteria: Within the Furnishings Zone if zone is 900 mm (3'-0") wide or greater. Removable planter boxes may be permitted within the frontage zone provided minimum Through Pedestrian Zone width is maintained.	
If the Siting Criteria can't be met, consider: • If siting planter would result in insufficient clearance, do not permit siting of planter.	

Poles, Light – Cobra Style

Responsibility: Bureau of Traffic Management, Street Lighting Division	**Footprint:** 300 mm x 300 mm (1'-0" x 1'-0")
Siting Criteria: Centerline of pole 750 mm (2'-6") from face of curb, or centered in Furnishings Zone, whichever is greater; poles and lights aligned along street corridor.	
If the Siting Criteria can't be met, consider: • On a large project, acquiring additional R.O.W. or easement so criteria can be met. • On a large project, developing curb extensions for fixtures like light poles. • On a smaller project, placing centerline of pole 450 mm (1'-6") minimum from face of curb where conditions are constrained.	

Table A-2. Elements in the Right-of-Way, continued

Poles, Light – Twin Ornamental Style

Responsibility: Bureau of Traffic Management, Street Lighting Division	**Footprint:** 600 mm x 600 mm (2'-0" x 2'-0")
Siting Criteria: Centerline of pole 750 mm (2'-6") from face of curb, or centered in Furnishings Zone, whichever is greater; poles and lights aligned along street corridor.	
If the Siting Criteria can't be met, consider: • On a large project, acquiring additional R.O.W. or easement so criteria can be met. • On a large project, developing curb extensions for fixtures like light poles.	

Poles, Signal

Responsibility: Bureau of Traffic Management	**Footprint:** 535 mm x 535 mm (21" x 21") pad maximum
Reference: Title 17.64	**Vertical Profile:** varies
Siting Criteria: Centerline of pole 750 mm (2'-6") from face of curb., or centered in Furnishings Zone if Furnishings Zone is greater than 1.5 m (5'-0").	
If the Siting Criteria can't be met, consider: • Setting pole closer to curb • Placing at back of walk, on acquired R.O.W. or easement, provided there is no building there and zoning does not permit or require future builliding at the right-of-way line. • Siting in curb extension on new project	

Poles, Utility

Responsibility: Street Management Systems; PGE, Pacific Power	**Footprint:** 400 mm - 450 mm (16" - 18") diameter
Reference: Street Management Systems Procedures Manual	**Vertical Profile:** varies
Siting Criteria: 600 mm (2'-0") centerline of pole to face of curb (450 mm [1'-6"] min) with 1.8 m (6'-0") min. clear Through Pedestrian Zone for Pedestrian Districts and City Walkways and 1.5 m (5'-0") min clear for Local Service Walkways (see TE for locations). Place pole on extended property line unless there is a conflict; other placement requires property owner consent.	
If the Siting Criteria can't be met, consider: • Setting pole closer to curb • Placing at back of walk, on acquired R.O.W. or easement if necessary, provided there is no building there and zoning does not permit or require future builliding at the right-of-way line. • On larger project, siting within curb extension • Reduce clear Through Pedestrian Zone to 4'-6" where Sidewalk Corridor (curb to ROW) is 6'-0" wide or less	

Table A-2. Elements in the Right-of-Way, continued

Poles, Utility – "Street Light Only" (SLO Poles)

Responsibility: Installed by utility company at request of Street Lighting Division	**Footprint:** 300 mm (1'-0") diameter
Siting Criteria: Centered in Furnishings Zone when zone is 900 mm (3'-0") wide or greater, with 1.8 m (6'-0") min. clear Through Pedestrian Zone for Pedestrian Districts and City Walkways and 1.5 m (5'-0") min clear for Local Service Walkways.	
If the Siting Criteria can't be met, consider: • Setting pole closer to curb • Placing at back of walk, on acquired R.O.W. or easement if necessary, provided there is no building there and zoning does not permit or require future builliding at the right-of-way line. • On larger project, siting within curb extension • Reduce clear Through Pedestrian Zone to 1.35 m (4'-6") where Sidewalk Corridor (curb to ROW) is 1.8 m (6'-0") wide or less	

Post Office Box, Collections Box

Responsibility: U.S. Postal Service	**Footprint:** 500 mm x 500 mm (1'-8" x 1'-8")
Siting Criteria: Centered in Furnishings Zone when zone is 600 mm (2'-0") wide or greater.	

Post Office Box, Neighborhood Delivery and Collection Box Unit (NDCBU)

Responsibility: U.S. Postal Service	**Footprint:** 380 mm (1'-3") to 710 mm (2'-4") width, 600mm (2'-0") depth on 150 mm x 300 mm (0'-6" x 1'-0") pedestal
Siting Criteria: Street face of unit flush with face of curb.	
If the Siting Criteria can't be met, consider: • Securing additonal R.O.W. or easement to achieve minimum clearance • Setting NDCBU into building wall. • Placing in curb extension	

Post Office Box, Relay Box

Responsibility: U.S. Postal Service	**Footprint:** 600 mm x 600 mm (2'-0" x 2'-0")
Siting Criteria: Centered in Furnishings Zone when zone is 2'-0" wide or greater.	

Signs, Parking

Responsibility: Bureau of Maintenance	**Footprint:** 65 mm (0'-2 1/2") diameter support, signs 300 mm (1'-0") wide
Reference: Title 16.20.200	**Vertical Profile:** Top of sign 1.5 m (5'-0") above sidewalk
Siting Criteria: 1. Use existing sign post, utility pole, or meter post if possible for sign placement. 2. For new posts, centerline of post 450 mm (1' - 6") from face of curb, top of sign at 1.5 m (5'-0") above sidewalk.	
If the Siting Criteria can't be met, consider: • For sidewalks less than 1.5 m (5'-0") wide, placing parking sign at back of walk in Frontage Zone or on building face.	

Table A-2. Elements in the Right-of-Way, continued

Signs, Street

Responsibility: Bureau of Maintenance, BTM	**Footprint:** 65 mm (0'-2 1/2") diameter support
Reference: Standard Construction Specifications 310.3.02	**Vertical Profile:** Bottom of sign typically 2.1 m (7'-0") above sidewalk or roadway

Siting Criteria: Within the Furnishings Zone if zone is 900 mm (3'-0") wide or greater.

If the Siting Criteria can't be met, consider:
- Placing signs at back of walk
- Mounting signs on building under agreement from owner

Signs, Traffic

Responsibility: Bureau of Traffic Management	**Footprint:** Traffic Control: Support 65 mm (0'-2 1/2") diam., signs vary to 750 mm (2'-6") Directional: Varies
Reference: BTM Rules and Procedures Manual; Manual on Uniform Traffic Control Devices	**Vertical Profile:** Bottom of sign typically 2.1 m (7'-0") above sidewalk or roadway

Siting Criteria: upport located in Furnishings Zone with street edge of sign 300 mm (1'-0") from face of curb when zone is 900 mm (3'-0") wide or greater.

If the Siting Criteria can't be met, consider:
- Flag mount traffic signs with support closer to curb than centerline of sign in order to maintain Through Pedestrian Zone
- Placing traffic sign at back of walk , provided sidewalk is attached and less than 1.8 m (6'-0") wide
- If building is located at back of R.O.W. and there is an on-street parking lane, remove parking and construct curb extension to site traffic signs
- If building is located at back of R.O.W. and no parking is at curbside, mount signs on building under agreement from owner

Signs, Transit

Responsibility: Tri-Met	**Footprint:** 65 mm (0'-2 1/2") diameter support, signs 300 mm (1'-0") wide
Reference: "Bus Stop and Passenger Amenities Guidelines," Tri-Met, June 1995	**Vertical Profile:** Typically 2.1 m (7'-0") to bottom of sign

Siting Criteria:
1. Use existing sign post or utility pole if possible for sign placement.
2. For new posts, centerline of post 450 mm (1' - 6") from face of curb. Street edge of sign minimum 300 mm (1'-0") from face of curb. Bottom edge of sign 2.1 m (7'-0") minimum height above sidewalk.

If the Siting Criteria can't be met, consider:
- Center post 450 mm (1'-6") from face of curb to obtain minimum clearance.
- Placing signs at back of walk on acquired R.O.W. or easement.
- If building is located at back of R.O.W., mount signs from building under agreement from owner.

Table A-2. Elements in the Right-of-Way, continued

Street Lighting Panels

Responsibility: BTM Street Lighting Division	**Footprint:** 200 mm x 400 mm (0'-8" x 1'-4")
Reference: Title 17, Section 68	**Vertical Profile:** 3'-8" tall

Siting Criteria: ypically centered in Furnishings Zone when zone is 900 mm (3'-0") wide or greater, sited so electrician can see street lights from the panel.

If the Siting Criteria can't be met, consider:
- Placing at back of walk, in Frontage Zone, or on acquired R.O.W. or easement if necessary, provided there is no building there and zoning does not permit or require future builliding at the right-of-way line.
- Placing around the corner on street with wider sidewalk, if present.

Street Trees

Responsibility: Urban Forestry Manager	**Footprint:** 1.2 m (4'-0") minimum width planting strip or 1.2 m x 1.2 m (4'-0" x 4'-0") tree well; 900 mm x 1.5 m (3'-0" x 5'-0") well minimum by special approval.

Siting Criteria: Centered in Furnishings Zone. Minimum Sidewalk Corridor width for tree siting is 2.75 m (9'-0"), with 900 mm x 1.5 m (3'-0" x 5'-0") grated tree well and reduction of Through Pedestrian Zone to 1.65 m (5'-6").

If the Siting Criteria can't be met, consider:
- On larger projects, developing curb extensions to site trees and street lights.

Telephones

Responsibility: Street Systems Management with review by District Traffic Engineer; standard utility check in underground wiring districts.	**Footprint:** Varies - 400 mm x 480 mm (1'-4" x 1'-7") mounted on 100 mm x 200 mm (0'-4" x 0'-8") post, typical; maximum size allowed is 900 mm x 900 mm (3'-0" x 3'-0").
Reference: Street Systems Management Phone Booth Permit Review, issued December 1995.	**Vertical Profile:** varies

Siting Criteria: Placed in Furnishings Zone only where border area (curb to ROW line) is 3.65 m (12'-0") or greater; located min. 600 mm (2'-0") from face of curb with min. 1.8 m (6'-0") clear through pedestrian zone maintained; not within 1.5 m (5'-0") of a building doorway area (extended to curb) or within 1.2 m (4'-0") of a fire hydrant, ornamental street light pole, or traffic signal equipment. No more than one payphone within 30 m (100 feet) of an intersection, or within 60 m (200 feet) of another payphone. No freestanding payphones allowed on the transit mall; on LRT street only with Tri-Met permission. No payphones abutting R2 or less dense residential zoning.

If the Siting Criteria can't be met, consider:
- If siting telephone would result in insufficient clearance, do not permit siting of telephone.

Transit Shelters

Responsibility: Tri-Met, BTED Development Services Division	**Footprint:** 1.35 m x 2.6 m (4'-6" x 8'-6")
Reference: Intergovernmental Agreement for Bus Shelter Siting, "Bus Stop and Passenger Amenities Guidelines," Tri-Met, June 1995	**Vertical Profile:** 2.5 m (8'-2")

Siting Criteria: In Furnishings Zone when minimum Through Pedestrian Zone is maintained;

If the Siting Criteria can't be met, consider:
- using shelter with narrow footprint
- reducing Through Pedestrian Zone to 1.05 m (4'-6") in certain cases by agreement

Table A-2. Elements in the Right-of-Way, continued

Trash Receptacles

Responsibility: Bureau of Maintenance (siting), Bureau of Environmental Services (collection).	**Footprint:** 810 mm (2'-8") diameter
Siting Criteria: Centered in Furnishings Zone when zone is 900 mm (3'-0") wide or greater. Adjacent to narrow side of shelter when transit shelter is present.	
If the Siting Criteria can't be met, consider: • Provide receptacles with narrower footprint to maintain Through Pedestrian Zone.	

Utility Vaults

Responsibility: Street Systems Management, Bureau of Water Works, utility companies	**Footprint:** varies
Reference: Street Opening Permit	**Vertical Profile:** no above ground structures are permitted in the ROW
Siting Criteria: Centered in Furnishings Zone when zone is 900 mm (3'-0") wide or greater. Vaults not permitted in Through Pedestrian Zone. Air vents for Utility Vaults should also be located within the Furnishings Zone.	
If the Siting Criteria can't be met, consider: • Provide vault location on private property	

Water Meters

Responsibility: Bureau of Water Works	**Footprint:** varies
Reference: Standard Plan 5-201	**Vertical Profile:** flush
Siting Criteria: Located within Furnishings Zone, typically 450 mm (1'-6") from face of curb to water service in vault.	
If the Siting Criteria can't be met, consider: • Locate meter within Through Pedestrian Zone with slip-resistant meter cover.	

Water Quality Sampling Stations

Responsibility: Bureau of Water Works	**Footprint:** 175 mm x 175 mm (0'-7" x 0'-7")
Reference: Standard Plan 5-108	**Vertical Profile:** 450 mm (1'-6")
Siting Criteria: Located within Furnishings Zone when zone is 900 mm (3'-0") wide or greater.	
If the Siting Criteria can't be met, consider: • Placing at back of walk, on acquired R.O.W. or easement if necessary, provided there is no building there and zoning does not permit or require future builliding at the right-of-way line.	

Sidewalk Corridors should contribute to the character of neighborhoods and business districts, and strengthen their identity.

Guidelines for Street Corners

Section B

B1 Introduction

Pedestrian activities are concentrated at street corners. These are the places where ways converge, where walkers wait for crossing opportunities, and where people are most likely to stop and converse with others.

Corners are also the place where access between the crosswalk at street grade and the (usually) raised sidewalk must be provided.

Street corners are important in the larger scheme of street systems. They are the logical location for hardware such as street name signs and traffic control signs or traffic signal bases. The design of the corner affects the speed with which turning traffic can maneuver through an intersection. Visibility at the corner is an issue for all users of the street system.

Corners are the places where ways converge, where walkers wait to cross, and where people stop to converse or get their bearings.

B1.1 Attributes of Good Street Corners

There are five attributes of good street corners within the pedestrian transportation network:

Clear Space — *Corners should be clear of obstructions, and have enough space to accommodate the typical number of pedestrians waiting to cross. They should also have enough room for curb ramps, for transit stops where appropriate, and for street conversations.*

Visibility — *It is critical that pedestrians on the corner have a good view of the travel lanes and that motorists in the travel lanes can easily see waiting pedestrians.*

Legibility — *Symbols, marks, and signs used at corners should clearly indicate what actions the pedestrian should take.*

Accessibility — *All corner features, such as ramps, landings, call buttons, signs, symbols, marks, textures, etc., must meet accessibility standards.*

Separation from Traffic — *Corner design and construction must be effective in discouraging turning vehicles from driving over the pedestrian area.*

Corners should be accessible, clear of obstructions, and provide good visibility and separation from traffic for pedestrians.

B1.2 Legal Aspects of Corners

Under Portland's City Code, Title 17.28.020, the City may take responsibility for installing and maintaining intersection corners and curbs, or may require the adjacent property owner to make improvements.

Title 17.28.035, Curb and Intersection Corner Ramps, requires all newly constructed or reconstructed intersection corners to include curb ramps.

All new or reconstructed corners must have curb ramps.

Title 17.28.110, Driveways, prohibits driveways located within 7.6 m (25'-0") of the corner of the lot where two streets intersect.

City of Portland Street Tree Planting Guidelines call for street trees to be placed no closer than 7.6 m (25'-0") to the curbline of an intersecting street.

The Americans with Disabilities Act (ADA), in section 14.2.4 of the Accessibility Guidelines for Buildings and Facilities, specifies several aspects of curb ramps that have a direct bearing on the design of corners. It should be noted, however, that this is an interim final rule, and that the final rule has yet to be adopted.

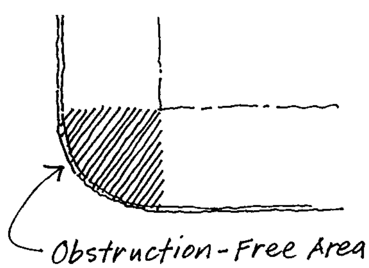
B2 DESIGNING AND IMPLEMENTING CORNER IMPROVEMENTS

B2.1 Obstruction-Free Area

Since the corner area must accommodate a concentration of pedestrian activities, and since sight lines need to be maintained for all street users, it is important to maintain an area that is free of obstructions.

B2.1a Obstruction-Free Area Defined

The obstruction-free area of a street corner is the space between the curb and the lines created by extending the property line (or the line of a public walkway easement) to the curb face, as shown in the adjacent illustration. Signal poles, street lights, telephone poles, hydrants, trees, benches, signs, controller boxes, private uses, and other vertical elements should not be located within this area.



The obstruction-free area of a street corner is the space between the curb and the lines created by extending the property line to the curb face.

Keeping these elements out of the Obstruction-Free Area should not result in placing them in other locations where they are an obstruction to pedestrians, such as the Through Pedestrian Zone in the Sidewalk Corridor.

B2.1b Exceptions to Obstruction-Free Area

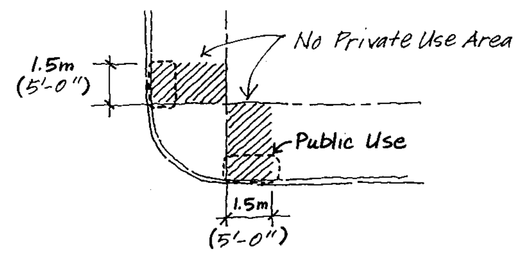
Exceptions to the obstruction-free guideline include bollards to separate pedestrians from traffic, and low posts for pedestrian call buttons at actuated signal controls.

B2.1.c Utility Poles

Frequently there are existing utility poles at the corners. Ideally, when a utility pole within the Obstruction-Free Area is to be replaced, it would be replaced outside the area. In many cases, the pole at the corner is associated with lines running on both streets of the intersection and it may be difficult to relocate the pole. If possible, two poles should be employed so that the single pole can be removed from the Obstruction-Free Area.

B2.2 "No Private Use" Area

To provide enough space for all the hardware that must be accommodated near the corner area, and to ensure good visibility at the corners, private temporary uses such as street vendors, sidewalk cafes, A-boards and newspaper vending machines are not permitted in an area 1.5 m (5'-0") back from the extension of the property line at any corner, as shown in the adjacent illustration.

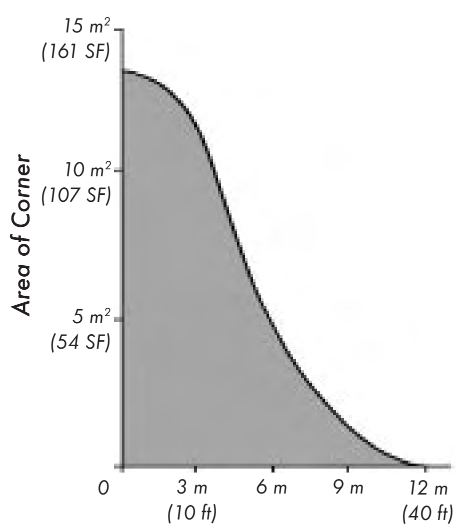


"No private use" area on either side of a corner. Public uses are encouraged to locate within the Furnishings Zone of this area.

B2.3 Adequate Pedestrian Area at Street Corners

Street corners should be large enough to adequately serve their multiple public functions. They must accommodate pedestrians walking through, those waiting to cross, and those who meet and stop to talk. The greater the pedestrian volume, the greater the area needed at each corner. Corners in Pedestrian Districts and corners that accommodate transit stops require the greatest area.

Unfortunately, other design considerations sometimes erode the space available for pedestrian activities at corners. Of particular concern is the choice of curb radius. As curb radius increases, the area of the corner decreases, as shown in the graph at the right.



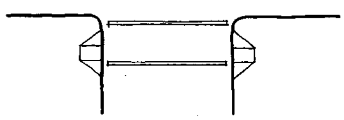
Graph showing how pedestrian area is reduced by increasing the curb radius at a typical corner where two 3.7 m (12 ft) sidewalks intersect. Note that pedestrian area begins to fall off sharply as the radius gets larger than 3 m (10'-0").

B2.3a Determining Adequate Pedestrian Area

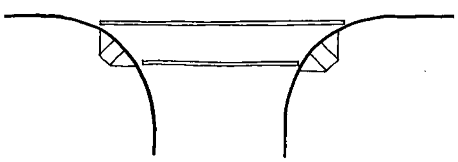
Several factors determine the ideal pedestrian area at the street corner. Among these are the expected volume of pedestrians on each sidewalk, the length of the expected pedestrian waiting time at the corner, and the size of the Through Pedestrian Zone extending through the corner. Although quantitative methods have been developed to calculate the level of service of corners,[1] in most cases it is not necessary to perform calculations if the needs of pedestrians are properly weighed against the needs of other modes.

B2.3b Strategies for Increasing Pedestrian Area

Where additional pedestrian area at the corner is desirable, for example because existing conditions are constrained or because a large corner radius is required, the designer may consider such strategies as the use of curb extensions, or the acquisition of additional right-of-way or a public walkway easement.



Tight curb radius means a shorter crosswalk.



Wide curb radius means a longer crosswalk.

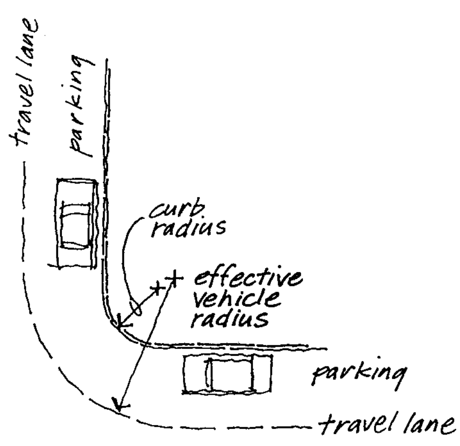
B2.4 Radius of the Curb at Corners

In general, the smaller the curb radius, the better for pedestrians. In comparison to a large curb radius, a tight curb radius provides more pedestrian area at the corner, allows more flexibility in the placement of curb ramps, results in a shorter crosswalk, and requires vehicles to slow more as they turn the corner. A small curb radius is also beneficial for street sweeping operations.

Existing corners in Portland vary in radius from as small as 750 mm (1'-6") to 9 m (30'-0") and above. In recent years, many Portland corners have been built with a radius of 4.6 m (15'-0").

B2.4a Effective Curb Radius

The presence of a lane for parking or bicycles creates an "effective radius" that allows the designer to choose a radius for the curb that is smaller than the turning radius required by the design vehicle.



An "effective radius" is created by the presence of a parking lane or bike lane.

B2.4b Choosing a Curb Radius

Several factors govern the choice of curb radius in any given location. These include the desired pedestrian area of the corner, traffic turning movements, the turning radius of the design vehicle, the geometry of the intersection, the street classifications, and

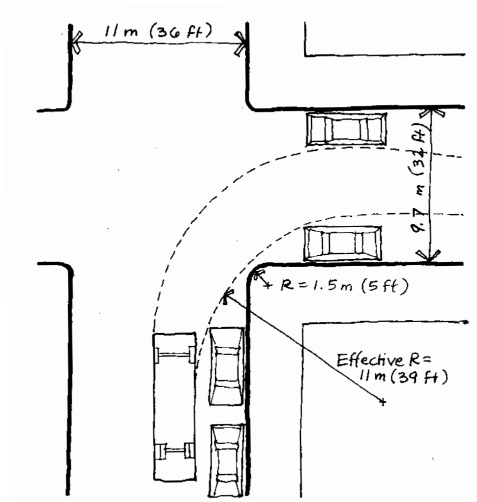
[1] Ideally, the corner should provide at least 0.5 sq m (5 sq ft) for each pedestrian expected to wait or pass by during any given period. In Pedestrian Districts and shopping areas, pedestrian volumes at corners may reach 20 pedestrians per minute. In areas of especially high pedestrian volume, the optimum size can be calculated using the methodology outlined in the Highway Capacity Manual, Chapter 13, Pedestrians.

whether there is parking or a bike lane (or both) between the travel lane and the curb.

The designer must balance all the factors, keeping in mind that the chosen radius should be the smallest possible for the circumstances. The radius may be as small as 900 mm (3'-0") where there are no turning movements, or 1.5 m (5'-0") where there are turning movements and there is adequate street width and a larger effective curb radius created by parking or bike lanes.

B2.4c Parking Control and Corner Radii

Designers sometimes consider that on-street parking will begin or end at the point of tangency or point of curvature of the corner radius. In practice, however, this point is not always evident in the field. Parking control should not be a factor in selecting curb radius.



Where there is an effective curb radius sufficient for turning vehicles, the actual curb radius may be as small as 1.5 m. (5 ft).

B2.5 Curb Ramps

Curb ramps are the design elements that allow all users to make the transition in grade from the street to the raised sidewalk. There are a number of factors to be considered in the design and placement of curb ramps at corners.

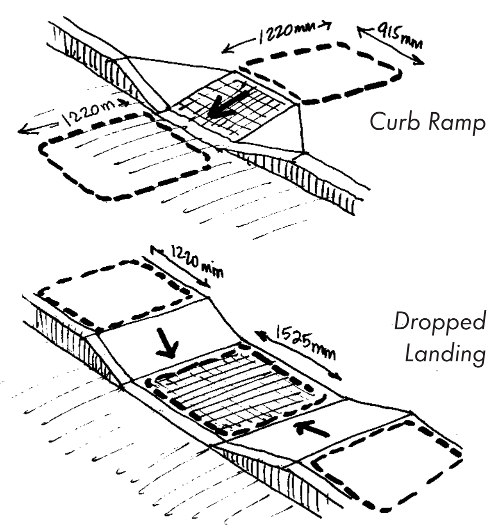
B2.5a Ramps and Landings

The ADA defines two types of curb ramp systems, "perpendicular ramps" and "parallel ramps." The first has a ramp into a crosswalk, while the second has a ramp into a landing that is flush with the street surface, sometimes called a "dropped landing." There are so many hybrid possibilities between these two types that it is perhaps easier to conceptualize in terms of simple ramps and landings. Refer to Table B-1 for Typical Curb Ramp Systems.

The basic principle is that every ramp must have a landing at the top and at the bottom. The maximum ramp slope in the right-of-way is 1:12 with a cross slope of no more than 1:50. The minimum width of a ramp is 915 mm (3'-0").

The landing at the top of a ramp should be at least 1220 mm (4'-0") long and at least the same width as the ramp itself. It should slope no more than 1:50 in any direction.

If the ramp runs directly into a crosswalk, the landing at the bottom will be in the roadway. The landing, 1220 mm (4'-0") long,



Basic principle: Provide a landing at the top and bottom of every ramp.

should be completely contained within the crosswalk and should not have a running slope of greater than 1:20.

If the ramp lands on a dropped landing within the sidewalk or corner area where someone in a wheelchair may have to change direction, the landing must be a minimum of 1525 mm (5'-0") long and at least as wide as the ramp, although a width of 1525 mm (5'-0") is preferred. The landing may not slope more than 1:50 in any direction.

A single landing may serve as the top landing for one ramp and the bottom landing for another.

B2.5b Texture for Ramp Surfaces

Ramps and dropped landings that lead directly to the roadway should have a surface that is finished with a heavy brooming pattern parallel to the curb.[2] Other textures and tactile warnings may be used at the discretion of the City Engineer.

B2.5c Recommended Landing Height at Corners

A corner landing height of 75 mm (0'-3") is recommended in order to have curb ramps that are in scale with other elements of the pedestrian realm.

Portland's standard height for new curbs is 175 mm (0'-7"). With a maximum slope of 1:12 and a typical sidewalk cross slope of 1:50 for drainage, the rule of thumb for ramp length is $l = 16h$, where l is the length of the ramp and h is the height of the curb. A 175 mm (0'-7") curb means a ramp length of 2840 mm (9'-4"). On most Portland corners such a ramp, with the required landing at the top, could not be accommodated.

As the ramp length increases, the wing area also increases, which reduces the functional area for pedestrians at the corner.

Keeping the landing height at 75 mm (0'-3") above the street level at the corner allows the ramps to be only about 1220 mm (4'-0") long. With ramps at this scale, it is easier to site two ramps and easier to maintain adequate pedestrian area at the corner.

[2] Standard Plan No. 3-120, etc. ADA Section 14 reserves the guideline on ramp texture at this time. The City of Portland is currently experimenting with other textures, and may modify this specification based on results.

A transition from the curb height along the sidewalk corridor may be achieved through the use of a parallel ramp (see b, Table B-1), or by raising the level of the street in the intersection slightly. Many existing corners in Portland have curb heights of 75 mm or less due to pavement overlays.

The low-landing strategy involves tradeoffs, since the reduced curb height provides less protection from storm water and from turning vehicles than a higher curb. Care in locating inlets can solve drainage problems. A higher curb may be desired where low-floor transit stops are sited, or where vehicle speeds are high, or in the vicinity of rail crossings.

Given the advantages of a curb as noted in A3.2, it is not recommended to drop the curb to street level for the entire corner area.

B2.5d Number of Ramps

Ideally, there should be a separate curb ramp for each crosswalk at a corner; that is, two ramps at most corners. It is also preferred to use curb ramps rather than dropped landings. However, there are a number of factors that influence the number and design of curb ramps at a corner, including sidewalk width, corner radius, adjacent materials, and crosswalk location.

In the case of large radius corners, it may be possible to use two ramps only if the crosswalks are moved away from the direct line of the sidewalk corridor. This design has the disadvantage of moving the stop line farther back, but the advantage that the pedestrian in the crosswalk has turning cars approaching from the side rather than the rear.

A number of typical design placements of curb ramps are shown in Table B-2.

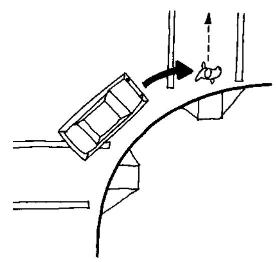
B2.5e Ramp Orientation

Ideally, the curb ramp is oriented so that the fall line of the ramp is both parallel to the crosswalk and perpendicular to the curb. Where other conditions are not constrained, the designer should locate the ramp so that both conditions can be met.

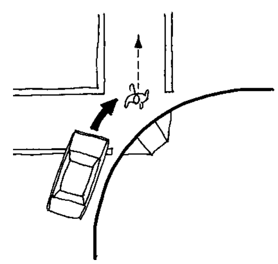
Where the curb radius is 3 m (10'-0") or less, and the sidewalk corridor on each intersecting street is 3 m (10'-0") or more, the fall lines of the ramp should be parallel to the crosswalks. Where curb radii are larger, or sidewalk corridors are narrower, curb

In the past, many corners in Portland were built with a single diagonal ramp.

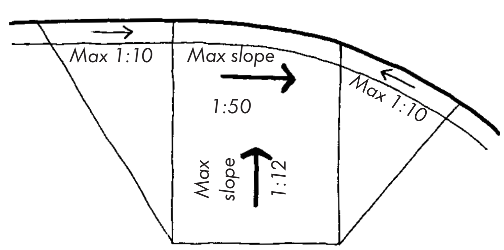
Two ramps is the preferred design.



Turning vehicle approaches pedestrian from the side where ramps are separated.



Turning vehicle approaches pedestrian from the rear at a single diagonal ramp.



When curb radius is 3 m (10'-0") or less, the curb ramp should be oriented parallel to the crosswalk ramps should be as nearly parallel to the crosswalk as possible, while maintaining a maximum cross-slope of 1:50. In order to avoid cross slope, it is sometimes necessary to orient the ramp perpendicular to the curb, or the tangent of the curbline.

B2.5f Ramp Maintenance

It is critical to accessibility that the interface between the ramp and the street be maintained adequately. The asphaltic concrete street section has a shorter life cycle than a Portland cement concrete ramp. Potholes in the asphalt at the foot of the ramp can catch the front wheels of a wheelchair, causing it to tip over.

In some cases, existing ramps and streets create a tipping hazard because of a sharp change in slope. As an interim solution, this sharp transition can be eased with a tapered infill of asphaltic concrete at the foot of the ramp.

B2.6 Locating Pedestrian Call Buttons

Pedestrian signal call buttons are used in cases where there are actuated signals for the signal controller to detect the presence of pedestrians. (See Section C, C2.7b for a further discussion of the use of call buttons.)

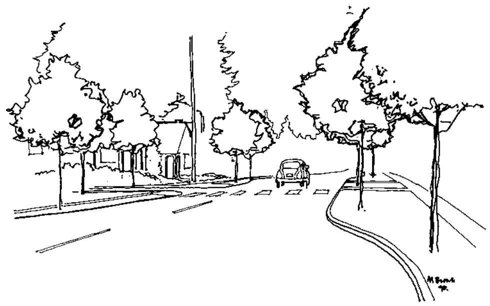
Where needed, pedestrian call buttons should be located to meet the following criteria:

- the closest push button to a crosswalk should call the pedestrian signal for that crosswalk
- an arrow indicator should show which crosswalk the button will affect
- the push button should be visible to a pedestrian facing the crosswalk, unless space constraints dictate another button placement
- the push button must be accessible from the level landing at the top of the curb ramp, or from the dropped landing of a parallel curb ramp

Where necessary, pedestrian call buttons may be located on low posts placed within the Obstruction-free Area of the corner.

B2.7 Curb Extensions

Curb extensions (sometimes called curb bulbs or bulb-outs) have many benefits for pedestrians. They shorten the crossing distance, provide additional space at the corner (simplifying the placement of elements like curb ramps), and allow pedestrians to see and be seen before entering the crosswalk.



Curb extensions shorten the crossing distance and allow pedestrians to see and be seen before entering the crosswalk.

B2.7a Locations for Curb Extensions

Curb extensions may be used at any corner location, or at any mid-block location where there is a marked crosswalk, provided there is a parking lane into which the curb may be extended. Curb extensions are not generally used where there is no parking lane because of the potential hazard to bicycle travel.

In Pedestrian Districts, curb extensions are a preferred element for corner reconstruction except where there are extenuating design considerations such as the turning radius of the design vehicle, or transit and on-street parking factors.

B2.7b Design of Curb Extensions

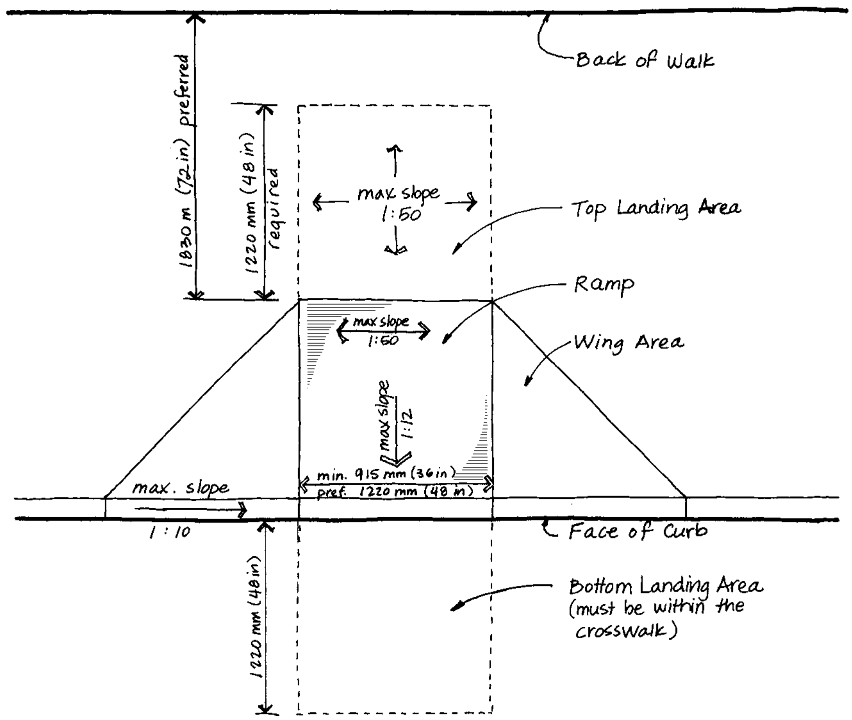
Curbs may be extended into one or both streets at a corner. The principles of an Obstruction-free Area and No Private Use Area also apply to the curb extension.

The design of curb extensions is guided by Standard Plan No. 3-126. Additional guidelines can be found in Table C-2, Crosswalk Toolbox.

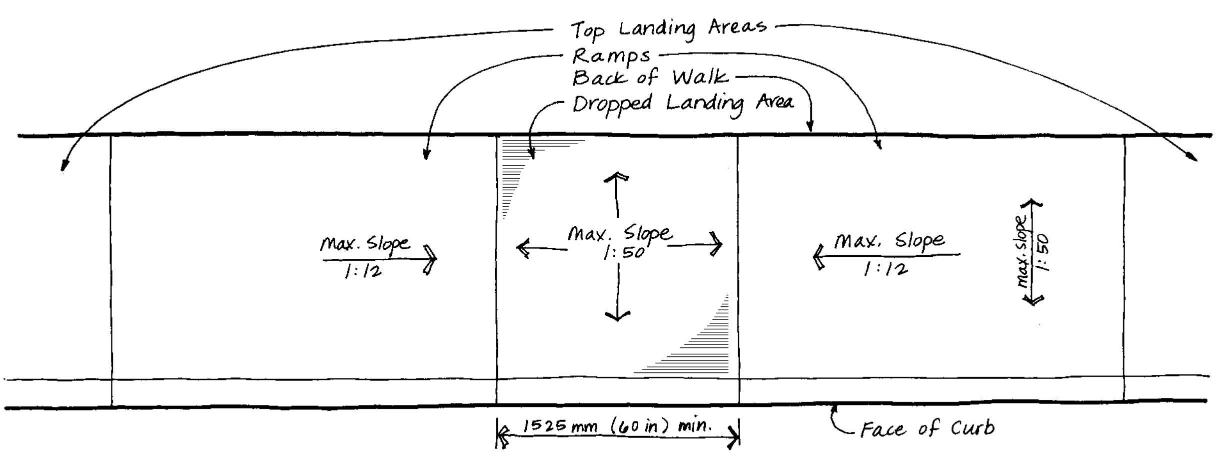
Curb extensions may include transit stops, eliminating the need for the bus to pull out of the travel lane to load and unload passengers. For design of transit curb extensions, consult the Tri-Met *Planning and Design for Transit Handbook*.[3]

[3] *Planning and Design for Transit Handbook: Guidelines for implementing transit supportive development.* January, 1996, Tri-Met (Tri-County Metropolitan Transportation District of Oregon, 4012 SE 17th Ave., Portland, Oregon 97201).

Table B-1. Typical Curb Ramp Systems

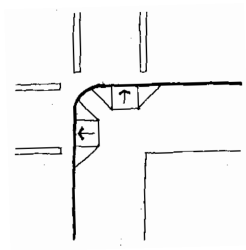


Curb Ramp

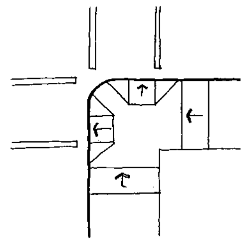


Dropped Landing

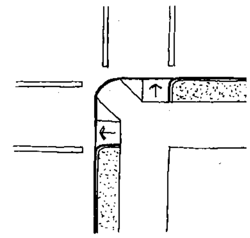
Table B-2. Typical Curb Ramp Placements



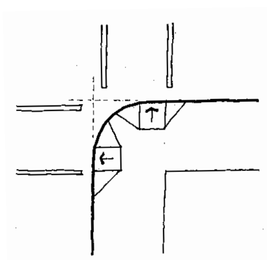
a. *With a 1.5 m (5 ft) radius on a typical 3. 7 m (12 ft) sidewalk corridor and a 75 mm (3 in) landing height, placing two ramps is easy.*



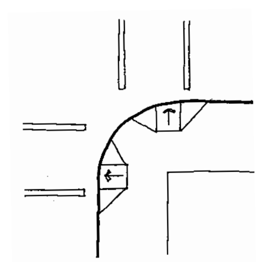
b. *A 75 mm (3 in) landing height can be achieved by ramping the entire sidewalk corridor down in advance of the corner.*



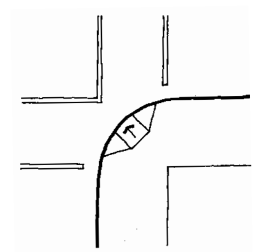
c. *Curb ramps may have returned curb in place of a side wing where the adjacent area is not paved for pedestrians.*



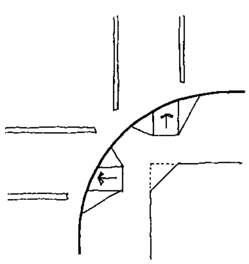
d. *3 m (10 ft) radius on 3.7 m sidewalk corridor allows two ramps with a slight crosswalk offset.*



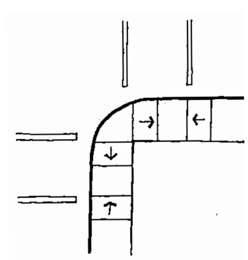
e. *4.6 m (15 ft) radius with two ramps, offset crosswalk.*



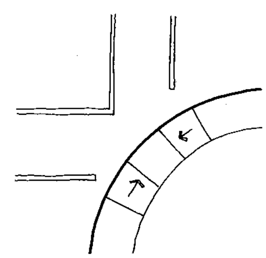
f. *4.6 m (15 ft) radius with a single diagonal ramp, minimum 1220 mm (4 ft) landing length required in crosswalk. Not recommended for new construction.*



g. *7.6 m (25 ft) radius on 3.7 m (12 ft) sidewalk corridor, two ramps are possible. Note addtional 1.5 m x 1.5 m (5 ft x 5 ft) triangle of R.O.W. required for adequate passage. Not recommended.*



h. *2 m (7 ft) sidewalk corridor with 3 m (10 ft) radius; two dropped landings. Not recommended. The preferred design would acquire additonal R.O.W.*



i. *2 m (7 ft) sidewalk corridor and 9 m (30 ft) radius, with a single dropped landing. Not recommended. The designer may considerusing a slip lane with a refuge island if this radius is necessary.*

Curb ramps at corners are an important element of an accessible pedestrian network.

Guidelines for Crosswalks

Section C

C1 INTRODUCTION

Crosswalks are a critical element of the pedestrian network. It is of little use to have a complete sidewalk system if pedestrians cannot safely and conveniently cross intervening streets. Safe crosswalks support other transportation modes as well. Transit riders, motorists, and bicyclists all may need to cross the street as pedestrians at some point in their trip.

Almost every pedestrian trip includes crossing the street.

C1.1 Attributes of Good Crosswalks

There are several attributes of good crosswalks. These can be realized through a variety of tools and designs. Some of these tools are described in the guidelines that follow.

Clarity — *It is obvious where to cross and easy to understand possible conflict points with traffic.*

Visibility — *The location and illumination of the crosswalk allows pedestrians to see and be seen by approaching traffic while crossing.*

Appropriate Intervals — *There is a reasonable match between the frequency of good crossing opportunities along a street and the potential demand for crossing.*

Short wait — *The pedestrian does not have to wait unreasonably long for an opportunity to cross.*

Adequate crossing time — *The time available for crossing accommodates users of all abilities.*

Limited exposure — *Conflict points with traffic are few and the distance to cross is short or is divided into shorter segments with refuges.*

Continuous path — *The crosswalk is a direct continuation of the pedestrian's travel path.*

Clear crossing -- *The crosswalk is free of barriers, obstacles and hazards.*

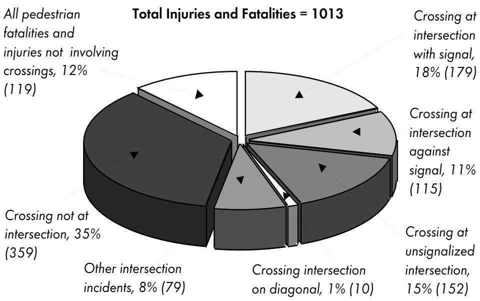
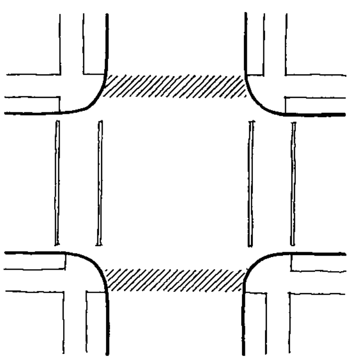


Figure C-1
Pedestrian Injuries and Fatalities in Portland, 1991-1995



If not marked, the legal crosswalk is the extension of the sidewalk on each side, as shown by the crosshatched area.

C1.2 Crosswalks and Pedestrian Safety

Almost nine out of ten pedestrian injuries and fatalities in Portland involve street crossings. Statistics for pedestrian injuries and fatalities for Portland between 1991 and 1995 are shown in Figure C-1. Clearly, crossing the street is the most dangerous element of a walk.

C1.3 Legal Aspects of Crosswalks

Oregon law[1] and Portland's traffic code[2] define a crosswalk as "any portion of a roadway at an intersection or elsewhere that is distinctly indicated for pedestrian crossing...." When crosswalks are marked across the road at an intersection, they are the only legal crosswalks across the road at that intersection. When no crosswalks are marked, the law defines a crosswalk at each leg of every intersection as the prolongation or connection of the lateral lines of the sidewalks on each side (or where the sidewalk would be if there is none).

At crosswalks, whether marked or unmarked, the pedestrian has the right-of-way.[3] The State of Oregon allows crossing at other locations provided the pedestrian yields the right-of-way to vehicles. Portland's traffic code requires pedestrians within 45.7 m (150'-0") of a legal crosswalk to use the crosswalk.[4]

Pedestrians are required to obey traffic control devices[5] and appropriate pedestrian behavior at different types of traffic control devices is specified in ORS 814.010.

Under ORS 811.550, parking is prohibited within an intersection, within a crosswalk, and within 6.1 m (20'-0") of a crosswalk at an intersection, unless it is specifically allowed by a traffic control device, such as a parking control sign.[6]

[1] ORS 801.220
[2] Title 16.90.085
[3] ORS 811.010
[4] Title 16.70.210
[5] ORS 814.020
[6] ORS 811.560(6)

C2 Designing and Implementing Crosswalk Improvements

C2.1 Crossing Treatments

In these guidelines, the term "crossing treatment" refers to physical treatment of a crosswalk to make it safer and more convenient for pedestrian travel. A crossing treatment may include the use of such tools as *median refuges, curb extensions,* or *pavement markings* at crosswalks. Many of these tools are presented in detail in **Table C-2, Crosswalk Toolbox**, beginning on p. C-14.

Designers should examine the need for crossing treatments in all new projects or retrofits to existing streets.

C2.2 Frequency of Crossing Opportunities

In general, whatever their mode, people will not travel out of direction unless it is necessary. This behavior is observed in pedestrians, who will cross the street wherever they feel it is convenient.

The distance between comfortable opportunities to cross a street should be related to the frequency of uses along the street that generate crossings (shops, transit stops, etc.). In areas with many such generators, like Pedestrian Districts, opportunities to cross should be very frequent. In areas where generators are less frequent, good crossing opportunities may also be provided with less frequency.

Where:	Generally not farther apart than:	Generally not closer together than:
In Pedestrian Districts and Main Street Pedestrian Design Areas	60 - 90 m (200 - 300 ft) (where blocks are longer than 120 m [400 ft])	45 m (150 ft)
On City Walkways	Varies, based on adjacent uses. Do not prohibit crossing for more than 120 m (400 ft)	45 m (150 ft)

Table C-1, Frequency of Crossing Treatments

Midblock crosswalks are installed where there is a significant demand for crossing and no nearby existing crosswalks.

C2.3 Locating Midblock Crosswalks

Midblock crosswalks are installed where there is a significant demand for crossing and no nearby existing crosswalks.

Where midblock crossing treatments are employed, they should be aligned where possible with logical pedestrian travel patterns. For example, it makes sense to locate a midblock crossing where a public walkway easement or pedestrian connector meets a street.

See Table C-2, Crosswalk Toolbox, for guidelines on *midblock crosswalks*.

C2.4 Pedestrian Delay at Unsignalized Crosswalks

Pedestrian delay occurs when a pedestrian must wait at the curb for an interval before it is safe to cross the street. At unsignalized crosswalks, pedestrian delay occurs when pedestrians feel they must wait for a safe gap in the traffic before crossing. Although pedestrians have the right-of-way, many people feel safer waiting for a gap than asserting their right to cross.

Average pedestrian waiting time should generally be no more than sixty seconds at an unsignalized crossing.[7]

Ideally, safe gaps should occur frequently enough that pedestrians will not be tempted to cross in unsafe gaps. Pedestrian delay at unsignalized crosswalks can be reduced either by adjustments to signals at nearby intersections (to increase gaps through platooning of traffic) or by the addition of *median refuge islands* (see Table C-2, Crosswalk Toolbox).

C2.5 Minimizing Exposure During Crossing

Crossing the street is both safer and more convenient when the crossing distance is short. Pedestrian exposure to travel lanes should be minimized to the greatest extent possible.

[7] The MUTCD (4C-5) suggests that 60 or more gaps per hour (approximately 60 seconds delay for a pedestrian waiting to cross) is a frequency adequate for pedestrian crossing. However, a study conducted in Boulder, Colorado (Pedestrian Crossing Treatment Warrants, Draft, May 1996, City of Boulder), indicates that pedestrians are willing to wait an average of only 15 seconds before crossing the street. That is, after waiting approximately 15 seconds, most pedestrians will cross in a smaller gap than earlier gaps that were rejected.

What constitutes a short crossing distance will vary given the surroundings. In general, 15 m (50'-0") is the longest uninterrupted crossing a pedestrian should encounter at an unsignalized crosswalk[8].

There are several tools that the designer can employ to minimize crossing distance. One of the simplest is to use a small radius for the corner (see section B2.4). Use of other tools is discussed below, and specific information about each tool can be found in Table C-2, Crosswalk Toolbox.

Very long crosswalks discourage pedestrian travel. Designers should avoid making crosswalks longer than 15 m (50'-0"). For wider streets, consider the use of median refuge islands.

C2.5a Curb Extensions

Curb extensions (also sometimes called "curb bulbs" or "bulb-outs") are one way to reduce the crossing distance for pedestrians. Curb extensions allow pedestrians to move safely beyond a lane of parked cars to a position where they can see and be seen as they begin their crossing.

Curb extensions can also provide an area for accessible transit stops and other pedestrian amenities and street furnishings.

Curb extensions can shorten crossing distance.

C2.5b Refuge Islands

Refuge islands allow pedestrians to cross one segment of the street to a relatively safe location out of the travel lanes, and then continue across the next segment in a separate gap. At unsignalized crosswalks on a two-way street, a median refuge island allows the crossing pedestrian to tackle each direction of traffic separately. This can significantly reduce the time a pedestrian must wait for an adequate gap in the traffic stream.

C2.5c Grade Separation of Pedestrians

Because pedestrians tend to cross where it is most convenient, grade-separated crossings are rarely successful where there is any possibility of gaps in the traffic stream that are adequate for crossing at grade.

Use grade-separated crossings only where it is not possible to provide an at-grade facility. Examples include crossing a freeway or major highway, a rail yard, or a waterway. See Table C-2 for guidelines on grade-separated crossings.

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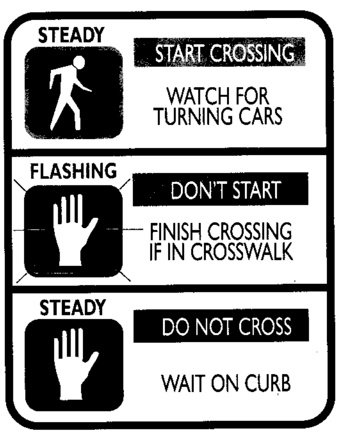
[8] The 15 m (50 ft) distance is a rough rule-of-thumb is based on discussions with assorted practitioners. Crossing distance may be reduced for distances less than this.

Pedestrian signal indication



Both motorists and pedestrians are sometimes confused about the meaning of the pedestrian signal indications. New signage in Portland should help to educate users about pedestrian signal operation.

C2.6 Crosswalk Pavement Markings

Marked crosswalks indicate to pedestrians the appropriate route across traffic, facilitate crossing by the visually impaired, and remind turning drivers of potential conflicts with pedestrians.

Crosswalk pavement markings should generally be located to align with the Through Pedestrian Zone of the sidewalk corridor.

See Table C-2, Crosswalk Toolbox, for specific guidelines on the use of pavement markings.

C2.7 Crosswalks and Traffic Signals

Traffic control signals are one way that both motorists and pedestrians can be given clear direction regarding the use of the roadway.

In Pedestrian Districts and Main Street Treatment areas, where priority is given to walking trips by City policies[9], it is appropriate to design for the convenience of pedestrians in considering signal placement and timing, even if it means reducing the efficiency of vehicle progression. For example, longer pedestrian phases may be desirable. The Traffic and Transit Classifications of the street in question must also be considered.

C2.7a Discussion of Crossing Intervals

One commonly voiced complaint about pedestrian signal indications is that they do not give pedestrians enough time to cross. In some cases, pedestrians perceive this to be the case because they do not understand the operation of the pedestrian signals. In other cases, pedestrians with disabilities truly may require more time to cross the street.

The operation of pedestrian signal indications includes three phases: WALK, flashing DON'T WALK, and steady DON'T WALK. Pedestrians are supposed to enter the crosswalk only on the WALK phase, but there likely will not be enough time to cross on it. Crossing continues during the "clearance interval" of flashing DON'T WALK, but pedestrians should not enter the crosswalk. During the steady DON'T WALK, pedestrians should not be in the crosswalk.

The minimum length for the WALK interval on a pedestrian signal indication is 4 to 7 seconds[10], just long enough for a pedestrian

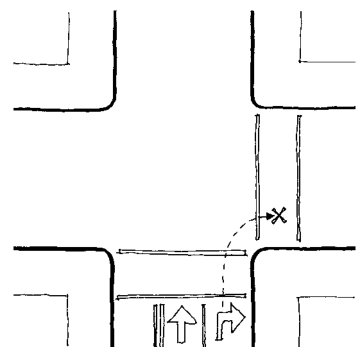
[9] See the *Transportation Element of the Comprehensive Plan*, p. 33
[10] MUTCD 4D-7

to step off the curb and begin crossing. The length of the clearance interval should be calculated based on crossing the entire street from curb ramp to curb ramp with an assumed crossing speed of 1.2 m/s (4 ft/sec). This assumed crossing speed may be reduced to 1.1 m/s (3.5 ft/sec) for pedestrians with disabilities.

Generally, the WALK interval is made as long as possible given the length of the green signal phase for traffic in the same direction; that is, the WALK interval is equal to the length of the green signal minus the clearance interval. Where the green signal phase for traffic would otherwise be shorter, the minimum time required to operate the WALK interval and clearance interval may control the length of the phase.

C2.7b Conflicting Movements of Pedestrians and Vehicles at Signals

Conflicts between vehicle movements and pedestrian movements at signals should generally be avoided, where possible.



The movements of traffic in turn lanes may conflict with pedestrian crossing.

In the case where an arrow signal is used to indicate a mandatory traffic turning movement, the green arrow phase is never actuated at the same time as the walk signal for the adjacent crosswalk across which the traffic will turn.

In other cases, such as at a "T" intersection or a turn-only lane, the traffic may have an ordinary green signal (as opposed to a mandatory arrow), and both the green signal and the walk signal are actuated simultaneously. Motorists are expected to yield to pedestrians in the crosswalk in this situation, but do not always recognize their duty, especially during the pedestrian clearance interval.

A dedicated pedestrian-only phase may be considered to alleviate these potential conflicts, depending on the length of the signal cycle, the traffic impacts and the relative traffic and transit classifications of the street. This treatment is especially appropriate in Pedestrian Districts.

C2.7c Pedestrian-Only Signals

Pedestrian-only traffic control signals are used at midblock location, where pedestrian volumes meet the warrants established in the Manual on Uniform Traffic Control Devices (4C-5). Pedestrian-only signals are always pedestrian-activated.

C2.7d Detecting Pedestrians at Signals

Traffic control signals in Portland generally operate in one of three modes:

Fixed-time signals have a regular cycle of phases with a fixed amount of green time for each movement. There is a regular WALK phase in each direction for each cycle. These signals are typically located in signalized grid systems like the Central Business District. Approximately fifty percent of the City's signals operate in this mode.

Fully-actuated signals use detection of vehicles and pedestrians to actuate all movements through the intersection. These signals are highly responsive to local traffic variations, and tend to be at some distance from other signals. Approximately 13% of the City's signals operate in this mode.

Semi-actuated signals have vehicle and pedestrian detection only on the side or local street movements (and sometimes for left turns from the arterial street). Both green signal and WALK phases are on for the major street when no other movement requests are detected. These signals tend to be at intersections where the streets are unequal in volume. Approximately 37% of the City's signals operate in this mode.

Push buttons should be marked so pedestrians know which signal is activated.

In both actuated signal situations, the pedestrian waiting to cross must be detected, either through pedestrian activation (the pedestrian pushes a button to get a WALK phase) or through passive detection (the presence of a waiting pedestrian is sensed through infrared or other types of detectors). Each method is discussed further below.

The most commonly used method of pedestrian detection is the pedestrian push button or call button. The purpose of the pedestrian push button is often misunderstood by pedestrians.

In a few cases, pushing the button means that, within a few seconds, the pedestrian indication will display WALK. However, in most actuated signal conditions, pushing the button means that the WALK will be actuated with the parallel green signal at the next signal cycle, which may mean a wait of up to a minute or more.

The delay that is often experienced in the latter case causes pedestrian confusion. Pedestrians who have pushed the button only to see nothing change for thirty or forty seconds sometimes believe the button is inoperative. Uncertainty about the length of delay is one factor in the perception that push buttons are pedestrian-unfriendly.

There may be technological solutions to the uncertainty problem. One possibility is to have a lighted call button (similar to an elevator call button) to let pedestrians know their request for a walk signal has been received. Such devices are commonly used in Europe, but are not without their technical difficulties.

A lighted call button could also be useful in those locations where the signal is operated in different modes depending on the time of day. In some locations, the call button is only needed during peak hours; at other times the signal operates in a fixed-time mode. In this case, the call button might be lighted at all times when the WALK phase will occur on every cycle.

Another possibility for reassuring pedestrians that their call for a walk signal has been received is to install an LED display above the existing pedestrian signal. The display could count down the number of seconds remaining to the WALK signal.

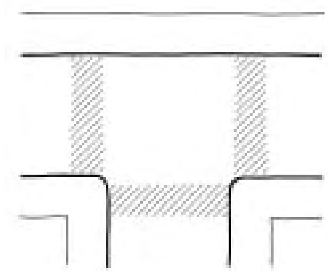
The use of passive detection for pedestrians waiting to cross could help to reduce frustrations for both pedestrians and motorists. The pedestrian needs to take no action in order to get a WALK phase. The passive detector can also sense if the pedestrian crosses in a gap before the WALK is actuated, and cancel the call for WALK, so that traffic is not stopped unnecessarily.

Passive detection may also be useful for detecting pedestrians who need more time to cross. The detection could cause either the WALK or the clearance interval to be extended until a slow-moving pedestrian has completed crossing.

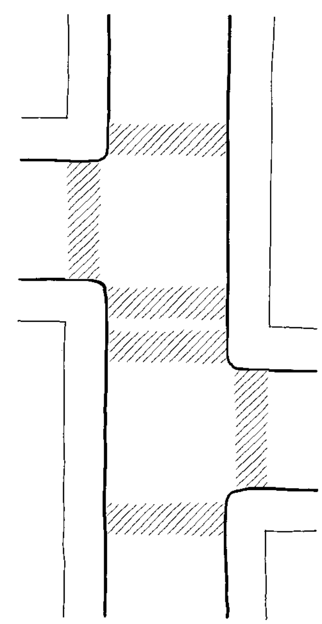
Currently, there is some concern that the passive detector may not detect all waiting pedestrians, or conversely, may be oversensitive and detect "phantom" pedestrians. Passive detection technology is fairly new and is likely to improve in the future.

C2.8 Crosswalks at "T" and Offset Intersections

This section addresses the special crossing conditions encountered at "T" and offset intersection with guidelines for pavement markings, curb ramps, parking control, pedestrian signals, and reduction of excess crosswalks.



Typical "T" intersection, showing all legal crosswalks



Typical offset intersection, showing all legal crosswalks

Portland has many "T" and offset intersections, often occurring along arterial streets on the lines between separately platted additions to the City. Under Oregon law[11] and Portland's traffic code,[12] there are legal crosswalks at these intersections, as indicated in the adjacent illustration, unless crossing is specifically prohibited, or unless some subset of the crosswalks has been designated through the use of pavement markings.[13]

For the crosswalks across the main street at these intersections, one end lands at a conventional corner, while the other end lands on a straight section of sidewalk. When the crosswalk is not marked on the pavement, the non-corner end of the crosswalk may be difficult to distinguish from a midblock location. In many such existing locations, curb ramps are missing and parking may be permitted across the crosswalk.

It is these crosswalks, with one end landing on the straight section of sidewalk, that are the focus of this section. The crosswalk or crosswalks that parallel the main street are not subject to the guidelines below.

C2.8a Pavement Markings for Crosswalks at "T" and Offset Intersections

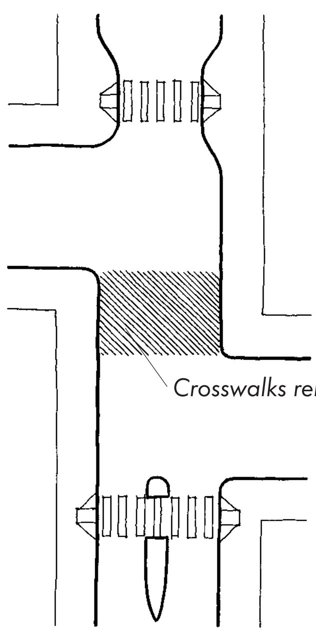
Use of pavement markings for crosswalks at "T" and offset intersections should follow the general guidelines for the placement of markings as spelled out in Table C-2, Crosswalk Toolbox, with the recognition that pedestrians may need more guidance at these crosswalks.

If pavement marking is appropriate for a crosswalk where one end lands on a straight section of sidewalk at an unsignalized intersection, a ladder-type marking should be used.

C2.8b Reduction of Excess Crosswalks

At offset intersections, or at closely spaced "T" intersections, overall pedestrian safety and convenience may be increased by selectively enhancing some crosswalks while eliminating others.

The adjacent illustration shows an offset intersection where the number of legal crosswalks has been reduced from four to two. In this case, the two crosswalks that remain are enhanced with curb extensions and pavement markings.



Offset intersections with crossing treatments to enhance the outer crosswalk and eliminate the inner ones.

[11] ORS 801.220
[12] Chapter 16.90.085
[13] See Section C1.3, Legal Aspects of Crosswalks.

In general, enhancement of the outer crosswalks and elimination of the inner crosswalks would be the preferred design at most offset intersections. However, other configurations may be chosen based on the particular site.

The pavement markings alone are enough to eliminate the crosswalks that are not marked, under ORS 801.220. The use of "No Pedestrian Crossing" signs is strongly discouraged. However, a sign encouraging pedestrians to use the enhanced crosswalks, "Pedestrians Use Marked Crosswalk," may be used.

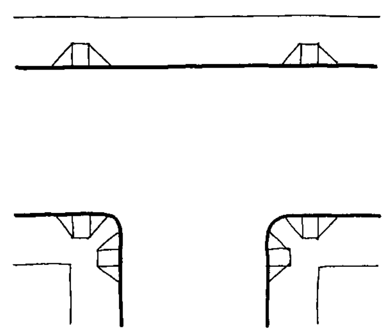
Sign for use where crosswalks are removed by enhancing adjacent crosswalks.

C2.8c Curb Ramps at "T" and Offset Crosswalks.

At "T" and offset crosswalks, as at all crosswalks, a curb ramp should be located at each end of each legal crosswalk.

Exception:

> Where curb ramps are installed as part of a project along existing streets with frequent "T" or offset intersections, if the cost of installing a ramp at every crosswalk is out of proportion to the cost of the project, it is acceptable to install curb ramps for one crosswalk of each pair. It is not necessary to prohibit crossing at the parallel crosswalk. For any crosswalk where ramps are not installed, there must be an accessible crosswalk within 30 m (100'-0").



Curb ramps are located at each end of each crosswalk at a "T"

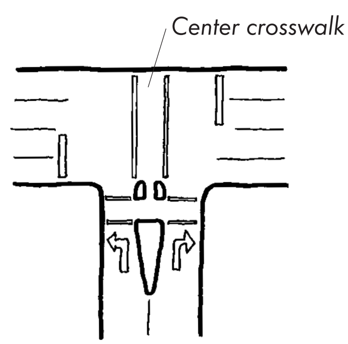
C2.8d Parking Control at "T" and Offset Intersections

At "T" and offset intersections, additional attention to the control of parking through signage may be warranted. See Table C-2, Crosswalk Toolbox, *Parking Control*.

C2.8e Pedestrian Signals at "T" and Offset Crosswalks

At a "T" intersection, all traffic from the "T" street must make a turning movement. There may be a perceived conflict between the turning movements on a green signal and pedestrians crossing on the WALK signal at the same time, although the traffic is supposed to yield to the pedestrians.

One design to reduce this conflict, where there is enough room, and where there is no adverse impact on pedestrian line of travel, is to have the crosswalk land on a refuge island between the right-turn and left-turn lanes.



To avoid conflict between pedestrian crossings and turning movements at a "T" intersection, the crosswalk can land on a refuge island between the right- and left-turn lanes.

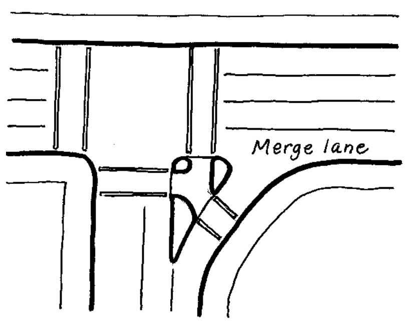
In Pedestrian Districts it may be possible to provide a separate pedestrian-only phase as discussed in section C2.7b.

C2.9 Crosswalks and Intersection Treatments

There are a number of intersection treatments that may require special attention to crosswalk design. Some of these are discussed below.

C2.9a Right-turn Slip Lanes

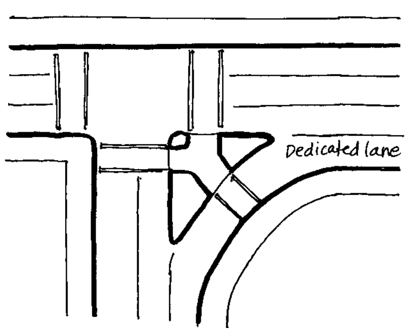
Right-turn slip lanes sometimes are provided to reduce traffic congestion by allowing the slip lane traffic to bypass a signalized intersection. The slip lane is separated from the originating street by a triangular refuge island sometimes called a "porkchop."



Slip lane where turning traffic must yield to cross traffic

Right-turn slip lanes are not recommended in areas of high pedestrian use. In general, a standard corner with a small curb radius works better for pedestrians than the slip lane design. However, there are a number of factors that affect how well a given slip lane treatment functions for pedestrians, and these factors are discussed here.

One factor is whether the turning traffic must yield to the cross-street traffic or has a dedicated lane to turn into. A slip lane design where turning traffic must yield to the cross street traffic gives a definite advantage to the pedestrian asserting his or her right-of-way in the crosswalk, compared to the dedicated lane design.



Slip lane where turning traffic moves into a dedicated lane and does not yield to cross traffic

Where the turning traffic must yield to the cross street traffic, if the traffic volume on the cross street is low it is also likely that the turning traffic volume will be low, so there will be gaps for pedestrians to cross. If the traffic volume is high on the cross street, turning traffic will have to stop, creating gaps for pedestrians.

Where the turning traffic moves into a dedicated lane and does not yield to cross traffic, speeds through the slip lane are likely to be higher, there may be inadequate gaps for pedestrian crossing, and drivers are likely to fail to yield to pedestrians.

Where slip lanes are used it is better from the pedestrian standpoint to design it so that turning vehicles must yield to the cross street traffic.

It is appropriate to use pavement markings to indicate the crosswalk location at a slip lane, since both pedestrians and motorists need guidance as to the correct location for crossing.

C2.9b Modern Roundabouts

The modern roundabout is an intersection treatment that appears to have some benefits in terms of traffic operation and safety over conventional signalized intersections. However, the benefits of roundabouts for pedestrian safety and convenience are not clear.

Of particular concern is the ability of visually impaired pedestrians, trained to use audible cues from the traffic movements, to judge when it is safe to cross.

A second concern is the distance pedestrians may need to travel out of direction to negotiate the roundabout.

The typical modern roundabout includes approach median islands (sometimes called splinter islands), which should serve as pedestrian refuges at the crosswalks. Crosswalks should be marked to show pedestrians and motorists the correct pedestrian crossing location.

C2.9c Traffic Circles

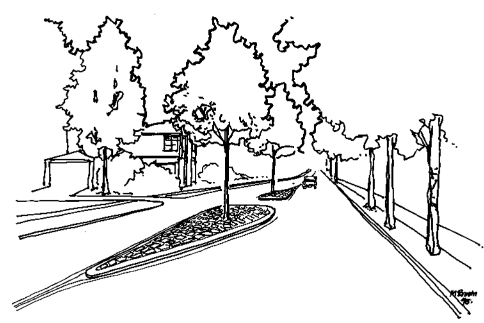
Traffic circles are used as traffic calming devices to slow traffic speeds. The circles are typically placed in the center of intersections.

Traffic circle

Pavement markings should be used where necessary to indicate offset locations of crosswalks around traffic circles. This may be needed to guide pedestrians away from the vehicle travel path around the circle.

C2.9d Slow Points

Slow point treatments are used as a traffic calming device to slow traffic speeds by narrowing the travel lanes, usually with a center median. This type of treatment can be installed at a midblock crosswalk, providing a refuge island for crossing pedestrians.



Slow point

C2.9e Traffic Diverters and Street Closures

Where traffic diverters or street closures are used for traffic management, pedestrian access needs to be considered and, where possible, should be maintained.

C2.10 Prohibiting Pedestrian Crossing

Typical intersections should allow pedestrians to cross in all the normal alignments. Prohibiting crossing should be considered only in limited circumstances. See Table C-2, Crosswalks Toolbox, *No Pedestrian Crossing*.

Table C-2
Crosswalk Toolbox

Audible pedestrian traffic signals

Purpose: To provide crossing assistance to pedestrians with vision impairment at signalized intersections

Reference: See Bureau of Traffic Management Guideline for Audible Signals

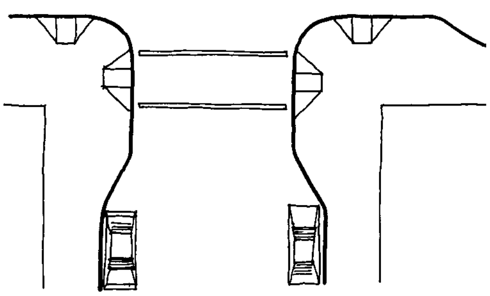
Where to use: To be considered for audible signals, the location must first meet the following basic criteria:

- The intersection must already be signalized.
- The location must be suitable to the installation of audible signals, in terms of safety, noise level, and neighborhood acceptance.
- There must be a demonstrated need for an audible signal device. The need is demonstrated through a user request.
- The location must have a unique intersection configuration and characteristics.

Guidelines:

- Audible signals should be activated by a pedestrian signal push button with at least a one second-delay to activate the sound.

Curb extension



Curb extensions

Purpose: To minimize pedestrian exposure during crossing by shortening crossing distance and give pedestrians a better chance to see and be seen before committing to crossing.

Reference: (new standard plan under development)

Where to use: Appropriate for any crosswalk where it is desirable to shorten the crossing distance and there is a parking lane adjacent to the curb. (Note that if there is no parking lane, the extensions may be a problem for bicycle travel and truck or bus turning movements.)

Guidelines:

- In most cases, the curb extension should be designed to transition between the extended curb and the running curb in the shortest practicable distance.
- For purposes of efficient street sweeping, the minimum radius for the reverse curves of the transition is 3.0 m (10 ft) and the two radii should be balanced to be nearly equal.

Curb ramps

Purpose: To make the sidewalk accessible from the roadway level of the crosswalk.

Reference: Title 17.28.035; Standard Plans 3-119a through 3-124; ADA Intermim Final Rule 36 CFR Part 1191, Appendix A: Accessibility Guidelines14.2.4.

Where to use: At every intersection location where there is a crosswalk, whether or not the crosswalk is indicated with pavement markings.

Guidelines: See Section B, Guidelines for Street Corners and Curb Extensions

Table C-2
Crosswalk Toolbox,
continued

Grade-separated crossing

Purpose: To completely separate pedestrian travel from vehicular travel

Where to use: Use only where it is not possible to provide an at-grade facility. Examples include crossing a freeway or major highway, a rail yard, or a waterway.

Guidelines:

- The crossing must be accessible.
- Grade changes should be minimized to the greatest extent possible.
- Shared bicycle/pedestrian facilities should have a clear passage width of at least 3.7 m (12'-0").

Median refuge island

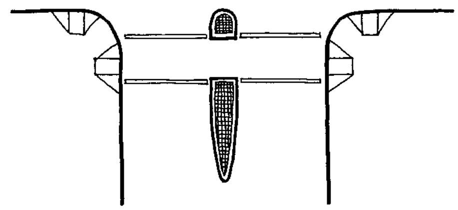
Purpose: To minimize pedestrian exposure during crossing by shortening crossing distance and increasing the number of available gaps for crossing.

Reference: MUTCD, Part V

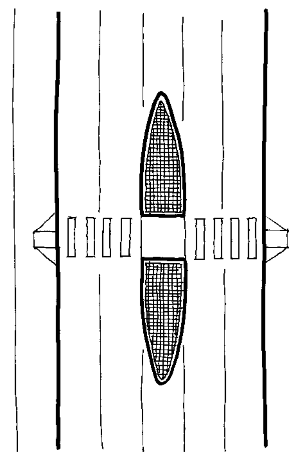
Where to use: Appropriate where the roadway to be crossed is greater than 15 m (fifty feet) wide or more than four travel lanes; can be used where distance is less to increase available safe gaps.
Use at signalized or unsignalized crosswalks.

Guidelines:

- The refuge island must be accessible, preferably with an at-grade passage through the island rather than ramps and landings.
- A median refuge island should be at least six feet wide between travel lanes and at least twenty feet long. On streets with speeds higher than 40 km/h (25 mph) there should also be double centerline marking, reflectors, and "KEEP RIGHT" signage.
- If a refuge island is landscaped, the landscaping should not compromise the visibility of pedestrians crossing in the crosswalk. Tree species should be selected for small diameter trunks and tree branches should be no lower than 4.3 m (14'-0"). Shrubs and ground plantings should be no higher than 450 mm (1'-6").
- Refuge islands at intersections should have a median "nose" that gives protection to the crossing pedestrian (see illustration).



Typical median refuge island at an intersection, with median nose and at-grade passage for crosswalk



Typical median refuge island at midblock, with at-grade passage for crosswalk

Midblock crosswalk

Purpose: To provide a crossing opportunity where there is no intersection.

Reference: Rule OPR-4401 of the BTM Rules and Procedures Manual

Where to use: At midblock locations, crosswalks are marked where

- there is a demand for crossing, and
- there are no nearby marked crosswalks.

Guidelines:
Midblock crosswalks are always indicated with pavement markings and warning signs.

Table C-2
Crosswalk Toolbox,
continued

No Pedestrian Crossing

Purpose: to avoid conflicts between pedestrians and traffic in situations that are especially dangerous.

Where to use: Prohibiting crossing should be considered only in very limited circumstances, for example:

- where it would be very dangerous for pedestrians to cross, as where visibility (for pedestrians or motorists) is obstructed and the obstruction cannot be reasonably removed
- where so many legal crosswalks exist that they begin to conflict with other modes, as on an arterial street with multiple offset or "T" intersections
- where there are unique considerations at a particular intersection and pedestrian mobility is not disproportionately affected by the closure

Guidelines:

- Do not close crosswalks at “T” and offset intersections unless there is a safer crosswalk within 100’ (30 m) of the closed crosswalk
- use "Pedestrians Use Marked Crosswalk" signs for crosswalks closed to reduce an excess of crosswalks on a street with “T” or offset intersections
- use "No Pedestrian Crossing" signs for crosswalks closed for pedestrian safety

Parking control

Purpose: to improve visibility in the vicinity of the crosswalk

Reference: ORS 811.550 and 811.560(6)

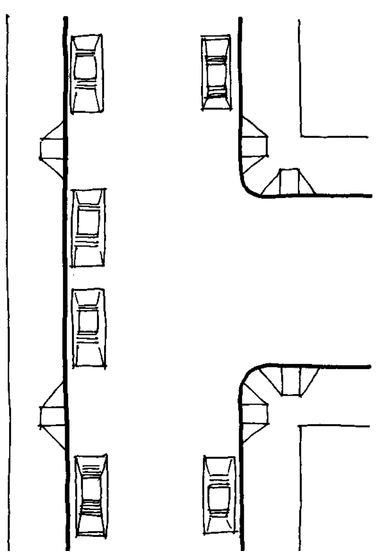
Where to use: Parking is prohibited within all intersections and crosswalks unless otherwise signed.

At “T” and offset intersections, where the boundaries of the intersection may not be obvious, this prohibition should be made clear with signage.

In areas where there is high parking demand (as determined by the City Traffic Engineer), parking for compact vehicles may be allowed within "T" or offset intersections and on either side of the crosswalk. At these locations, signs will be placed to prohibit parking within the designated crosswalk areas.

Parking shall not be allowed within any type of intersection adjacent to schools, school crosswalks, and parks. This includes "T" and offset intersections.

Guidelines:
Installation of parking signage to allow and/or prohibit parking within any given intersection will occur at the time that the Parking Control section is undertaking work at the intersection.



In areas with high parking demand, compact parking may be permitted within the intersection, but crosswalks should be kept clear.

Pavement markings for crosswalks

Purpose: To indicate to pedestrians the appropriate route across traffic, to facilitate crossing by the visually impaired, and to remind turning drivers of potential conflicts with pedestrians

Reference: MUTCD (3B-18), the Oregon Vehicle Code (ORS 811.550(17)), and Rule OPR-4401 of the BTM Rules and Procedures Manual

Where to use: At signalized intersections, all crosswalks should be marked.

At unsignalized intersections, crosswalks should be marked when they
- help orient pedestrians in finding their way across a complex intersection, or
- help show pedestrians the shortest route across traffic with the least exposure to vehicular traffic and traffic conflicts, or
- help position pedestrians where they can best be seen by oncoming traffic.

At midblock locations, crosswalks are marked where
- there is a demand for crossing, and
- there are no nearby marked crosswalks.

Guidelines:

- Use parallel pavement markings for signalized or stop-controlled crosswalks. A parallel pavement marking consists of two 300 mm (1'-0") wide stripes placed 3 m (10'-0") apart (inside dimension) to delineate the outside edges of the crosswalk, parallel to pedestrian travel. Where there is a compelling reason to narrow the crosswalk, the inside dimension between stripes may be reduced to as narrow as 1.9 m (6'-0").

- Use ladder pavement markings for crosswalks at school crossings, across arterial streets for pedestrian-only signals, at midblock crosswalks, and where the crosswalk crosses a street not controlled by signals or stop signs. A ladder pavement marking consists of 600 mm (2'-0") wide, 3 m (10'-0") long bars on 1.5 m (5'-0") centers, with the bars placed perpendicular to pedestrian travel.

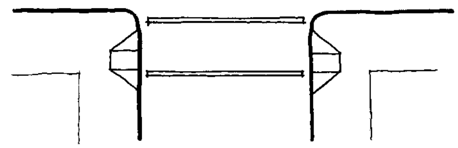
- Where the Sidewalk Corridor is wider than 3.7 m (12 ft) the crosswalks may be wider than the standard width to match the Sidewalk Corridor.

- At midblock locations, marked crosswalks are always accompanied by signing to warn drivers of the unexpected crosswalk.

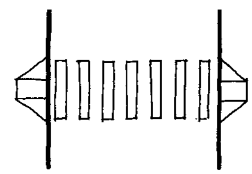
- The crosswalk should be located to align as closely as possible with the Through Pedestrian Zone of the Sidewalk Corridor.

- Where traffic travel lanes are adjacent to the curb, crosswalks should be set back a minimum of 600 mm (2'-0") from the edge of the travel lane.

Table C-2
Crosswalk Toolbox,
continued



Parallel pavement markings



Ladder pavement markings

Table C-2
Crosswalk Toolbox,
continued

Pedestrian push buttons

Purpose: To permit the signal controller to detect pedestrians desiring to cross

Where to use: Used at an actuated or semi-actuated traffic signal

Guidelines:

- When push buttons are used, they should be located so that someone in a wheelchair can reach the button from a level area of the sidewalk without deviating significantly from the natural line of travel into the crosswalk.

- The button should be marked (for example, with arrows) so that it is clear which signal is affected.

- In general, use of pedestrian push buttons should be avoided in areas of high pedestrian use, such as Pedestrian Districts and Main Street Treatment areas. However, the pedestrian classification must be balanced with the other functions of the street. In Pedestrian Districts and Main Street Treatment areas, there should be a demonstrated benefit for actuated signals before push buttons are installed. The following are some criteria for that benefit:

  - the main street carries through traffic or transit, such as a Major City Traffic or Transit Street, or a District Collector
  - traffic volumes on the side street are considerably lower than on the main street
  - the pedestrian signal phase is long (for example, on a wide street) and eliminating it when there is no demand would significantly improve the level of service of the main street

- Where push buttons must be installed in high pedestrian use areas, designers should consider operating the signal with a regular pedestrian phase during off-peak hours.

Pedestrian signal indication ("Ped Head")

Purpose: To indicate to pedestrians when to cross at a signalized crosswalk

Reference: MUTCD (Part IV-D)

Where to use: All traffic signals should be equipped with pedestrian signal indications except where pedestrian crossing is prohibited by signage.

Table C-2
Crosswalk Toolbox,
continued

Porkchop refuge island (see Median refuge island)

Purpose: to shorten crossing distances and provide a refuge for pedestrians between separated traffic movements

Where to use: Use with right turn slip lanes, modern roundabouts, or other intersection treatments where pedestrians benefit from a refuge. Can also use at "T" intersections between right-turning and left-turning travel lanes. Note that right-turn slip lanes are not recommended in areas of high pedestrian use.

Guidelines:

- Refuge must be accessible.
- Crosswalks should be indicated with pavement markings to show pedestrians and motorists the correct crossing location.
- Generally, the crosswalk should be set back 6 m (20 ft) from the point where the traffic merges, so that pedestrians cross behind the first vehicle, and should be oriented perpendicular to the line of vehicle travel.

Raised crosswalk or raised intersection

Purpose: to eliminate grade changes from the pedestrian path and give pedestrians greater prominence as they cross the street

Where to use: use only in very limited cases where a special emphasis on pedestrians is desired; review on case-by-case basis

Guidelines:

- Use detectable warnings at the curb edges to alert vision-impaired pedestrians that they are entering the roadway.
- Approaches to the raised crosswalk may be designed to be similar to speed humps, or may be designed so they do not have a slowing effect (for example, on emergency response routes).

A midblock crossing improvement on a five-lane arterial street with parking. Among the crosswalk tools employed are a fully landscaped median refuge island, curb extensions and ladder pavement markings.

Guidelines for Pathways and Stairs

Section D

D1 Introduction

The use of pathways and stairs in the pedestrian network ensures that opportunities for public access are not lost.

Pathways and stairs differ from the City's public sidewalks in a number of ways. While the City's sidewalks are clearly defined as public walkways, the public nature of pathways and stairs is sometimes less obvious. In some cases, they use different materials. The selective use of pathways and stairs allows us to address constraints in our transportation system so that opportunities for public pedestrian access are not lost.

Pathways and stairs can serve as pedestrian connections, to shorten walking trips in places where the street system is discontinuous or where blocks are large. They may be located in unimproved street rights-of-way, in public walkway easements on private property, or on off-street paths in parks or other open space areas.

Pathways can also serve in place of a standard sidewalk along a roadway in certain cases. There are many instances in Portland where providing the full urban standard of concrete curb and sidewalk is difficult due to factors such as steep terrain, inadequate roadway drainage, significant mature trees, and right-of-way constraints.

Where there are existing roadways without pedestrian improvements, these alternative pathways can be provided as interim improvements, using techniques or materials that are alternatives to the City standard of a concrete sidewalk with curb and storm drain. Alternative pathways can be used on arterial streets where it is not anticipated that a full urban standard will be built in the foreseeable future, if at all.

This section lays out guidelines, first for pathways and stairs that serve as pedestrian connections, and then for alternative pathways along a roadway.

D1.1 Attributes of Good Pathways and Stairs

Security -- *Stair and path placement, landscaping, and lighting all contribute to making walkers feel safe as they traverse the connection, and visibility to and from the connector is maintained to ensure "eyes on the path."*

Public Character -- *It is clear that the facility is a public right-of-way or easement, and that the public is welcome. Stairs or pathways in undeveloped rights-of-way or pedestrian walkway easements are clearly public, and send an invitation to pedestrians that they can safely use these facilities.*

Appropriate Accessibility -- *The facility is as accessible as possible, given the constraints of topography. Where full accessibility is not possible, alternate continuous passages are available.*

Direct Connection -- *The facility takes the most direct route that is practical from end to end.*

Safety -- *The connector provides adequate protection for pedestrians from motor vehicle traffic, and the path is relatively level, resistant to slipping, and free of tripping hazards.*

Durability -- *Surface materials are stable and provide a reasonable walking surface over the course of the inspection and maintenance cycle, and will continue to meet ADA where required.*

Compatibility -- *The design of pathways and stairs will respect the existing conditions and environment.*

Cost Effectiveness -- *Pathways installed as alternative interim improvements adjacent to roadways will cost less to design, construct and maintain than the City standard sidewalk and curb.*

D1.2 Legal Aspects of Pathways and Stairs

D1.2a Pathways, Stairs and the Code of the City of Portland

Alternative pathways, stairs and connectors are not defined under City of Portland code. However, the City does have standard specifications and details for public stairs.[1]

For the purposes of this chapter, alternative pathways can be defined as facilities within public right-of-way or public walkway easements which are designed to accommodate pedestrian access. The closest definition to pathway in the City Code is that of "Sidewalk," which may be the most appropriate definition when dealing with pathways separated from the roadway through vertical separation, such as a curb, or horizontal separation, such as a planting strip or a drainage swale, or both.

[1] Standard Plans 3-170 to 3-173 in the City of Portland Standard Construction Specifications, 1997.

"Sidewalk" is defined in Titles 16 and 17 of the City's Code, and the definitions are slightly different. In Title 16, the term refers to the area between the curb or roadway edge and the property line, whether or not it is improved. In Title 17, the term is used to refer to the sidewalk improvement itself.

Pathways will require some level of ongoing maintenance, and maintenance of sidewalks is also defined in the City Code, Chapter 17.

Under Chapter 17.28, responsibility for the construction, reconstruction, maintenance, and repair of the sidewalk improvement, as well as liability for any damages or injuries resulting from defective conditions of the sidewalk, is assigned to the abutting property owner. Authority is delegated to the City Engineer to require the repair or construction where it is needed.

The Bureau of Maintenance, as a matter of policy, assumes responsibility for inspection and maintenance of public stairs.

Title 18, Chapter 18.03, Nuisance Abatement, notes the abutting property owner's responsibility for ensuring that the sidewalk is kept clear of debris and projecting bushes and limbs up to 2.3 m (7'-6") from the sidewalk surface and that the roadway is kept clear of debris and project bushes and limbs up to 3.4 m (11'-0") from the roadway surface on local streets and 4.3 m (14'-0") from the roadway surface along arterials, one-way streets, and streets where parking has been prohibited.

D1.2b Pathways, Stairs and the Americans with Disabilities Act (ADA)

Continuous Passage

A continuous passage is defined under ADA as "A continuous unobstructed pedestrian circulation path within a public sidewalk connecting pedestrian areas, elements, and facilities in the public right-of-way to accessible routes on adjacent sites."[2]

Surface

The ADA requires that "public sidewalk surfaces be stable, firm, and slip-resistant and lie in a single plane with minimal warping."[3]

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[2] The Federal Register, Vol. 59, No. 117, Monday, June 20, 1994. Rules and Regulations, 14.1.1 (p. 31778).
[3] Ibid., 14.2.1(3) Surfaces (p. 31727).

Slope

The ADA defines maximum cross slopes for continuous passages as 1:50 (2%).[4] No limit on running grade is required for public sidewalks when they are following the grade of a public street.

Detectable Warning

Detectable warnings at curb ramps are still under study by the Architectural and Transportation Barriers Compliance Board, Department of Justice, and Department of Transportation. The access board suspended detectable warning requirements temporarily until July 26, 1998. At this time there are no requirements, and detectable warnings are a matter of "best judgment."

Separation

The ADA requires that public sidewalks be separated horizontally or vertically from the adjacent roadway with continuous curbing, planted parkways, or other barriers to distinguish streets from public sidewalks. The board considers all pedestrian ways, including shoulder walkways, to be "sidewalks." It defined the term "other barriers" to include material and texture changes, physical barriers, such as planters or guardrails, or distinguishable edges, such as wheelstops or guidestrips.[5]

Treads and Risers

A minimum width of 280 mm (0'-11") is required for stair treads, and tread widths and riser heights are required to be consistent over the entire flight of stairs. Nosings shall not project more than 38 mm (0'-1 1/2") from the face of the riser.

Handrails

Handrails are required by ADA on both sides of the stair, and must be continuous along the stair. Where they are not "continuous" (e.g., where the handrail stops at the top or bottom of the stair), handrails are required to extend "... at least 305 mm (1'-0") beyond the top riser and at least 305 mm (1'-0") plus the width of one tread beyond the bottom riser."

For the complete requirements, consult the ADA Accessibility Guidelines for Buildings and Facilities, Section 4: Accessible Elements and Spaces: Scope and Technical Requirements.

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[4] The Federal Register, Vol. 59, No. 117, Monday, June 20, 1994. Section 14.2.1(2)(b) (p. 31778).

[5] Ibid. Section 14.2.1(4) (p. 31728).

D2 The Design and Implementation of Public Connector Pathways and Stairs

Public pathways and stairs help shorten walking distances in many parts of the City where undeveloped rights-of-way, steep terrain, public walkway easements or a combination of these factors suggest a different approach to providing pedestrian access. Perhaps the most typical examples found in the City are the numerous stairs found in the West Hills, which provide direct connections across difficult terrain and shorten walking distances significantly.

In other parts of the City where terrain is more gentle, pathways provide connections between streets, and take many forms -- sometimes a well-maintained concrete or asphalt walk, sometimes a beaten dirt path. Whatever their form, these pathways, like stairs, can shorten walking distances and provide important access between public streets or various destinations.

There are a few basic types of connector pathways, each of which has unique characteristics. Some pathways are intended to be shared with bicyclists, requiring additional width and a reasonably even grade with no abrupt grade changes. Other connectors are intended to be used only by pedestrians, and may or may not be accessible. Some connector pathways include public stairs.

Numerous public stairs are found in Portland's West Hills.

D2.1 General Guidelines for Public Pedestrian Connections

D2.1a Right-of-way/Easement Widths

Minimum widths for connectors help to provide adequate width for the pathway, space to maintain the path, space to clear significant vegetation or other natural features, and buffer area between the pathway and adjacent uses.

Where the path is to be shared by pedestrians and bicyclists, a minimum R.O.W. or easement width should be 7.6 m (25 '-0"). This width would easily accommodate a 3.7 m (12'-0") path.[6]

For connectors which are not intended for shared use by bicyclists and/or which also have stairs as part of the route, a minimum R.O.W. or easement width should be 4.5 m (15'-0"), which would easily accommodate a 1.8 m (6'-0") pathway.

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[6] Refer to City of Portland Standard Construction Specifications, Standard Plan No. 3-139, Bicycle Path Construction.

D2.1b Continuous Passage

If the connector pathway is part of what is to be considered a continuous passage (as defined in ADA), it must be constructed to meet ADA standards. This includes providing a firm, level surface constructed of concrete, asphalt or unit pavers, and ensuring that the grade of the connector does not exceed 1:20 without intermediate landings, or 1:12 with landings every 9.1 m (30 '-0"). A continuous passage should not include stairs. Crushed rock, gravel, or bark mulch are not appropriate materials for connector pathways which are considered part of a continuous passage.

For pedestrian-only pathways, a minimum width of 1.8 m (6'-0") is required, while a minimum pathway width of 3.7 m (12'-0") is suggested to accommodate bicyclists on the route as well. For paths over 2.5 m (8'-3"), some type of design treatment is needed to ensure that the pathway is not used by automobiles. Narrowing the entrance to the path is preferred over the use of bollards, which can be a hazard to bicycle travel.

D2.1c Non-continuous Passage

In many cases, connector pathways are either alternatives to other existing continuous passages, or cannot be accessible by definition due to grade issues. In these cases, it is not necessary to provide the same level of finish that a continuous passage would require. Firm surfaces provided by concrete, asphalt or unit pavers are encouraged; however, it is possible to use crushed rock or bark mulch as an alternative on non-continuous passages. A minimum width of 1.8 m (6'-0") is recommended for these routes.

D2.1d Stair/Pathway Combinations

While a combination of stairs and pathways is by definition not fully accessible, there are still a number of accessibility issues defined by ADA (e.g., railings or surfaces) which should be addressed in this type of connection. Even for those routes that are non-accessible, there should be a 1.8 m (6'-0") landing area the width of the stairs at the top or bottom of the stair, constructed from concrete. This landing should also be repeated for every 3.6 m (12'-0") of rise. The maximum slope in this landing area should be 1:50 in any direction. These landings will provide a firm, level surface at the top or bottom of stairs for people to safely access the stair from the connector pathway, and will also provide resting places along the way up and down the stair.

D2.1e Lighting

Lighting considerations will vary depending on the site and expected use. Generally, connector pathways and stairs should be lit sufficiently to help avoid tripping accidents and to provide security and visibility at night. At a public stair, the top and bottom of each stair should be adequately lit so that the first step is obvious to the pedestrian and the railing is visible.

D2.1f Signage

Where a public connector pathway or stair is within a public right-of-way, or an easement which follows a vacated right-of-way, standard street signage can be used to help identify the connector as well as to communicate that the connector is public. Signage should also be provided which informs users about where the connector leads to, e.g., "To SE 55th Avenue," or "Public Stairway - to NW Vista."

Where a connector pathway or stair provides pedestrian access between dead-end or cul-de-sac streets, signage to that effect should appear near the "Dead End" warning sign.

D2.2 Guidelines for Connector Pathways

D2.2a Materials

Connector pathways should be built with materials in accordance with the Appendix on Materials in this Guide. In general, accessible pathways should be built to meet ADA standards and should be easily maintained over time. Non-accessible pathways may be built with alternative materials like asphalt or crushed rock, but concrete is still the preferred material for construction.

D2.3 Guidelines for Public Stairs

D2.3a Setback from Existing Public Sidewalks

The first riser at the bottom of a stair should be no closer than 750 mm (2'-6") to the sidewalk, and at the top no closer than 450 mm (1'-6") to the sidewalk. This is suggested because almost all public stairs will require handrails, and to meet ADA the handrail must extend beyond the top and bottom steps. At the top the handrail must extend 305 mm (1'-0"), while at the bottom it must extend 305 mm (1'-0") plus the width of the first tread. The placement of the stair and handrail should accommodate the existing sidewalk, future sidewalk, or anticipated future sidewalk widening.

D2.3b Materials

Current standards for public stairs call for concrete treads and risers.[7] Treads should be finished with a light broom or similar finish to ensure that the surface has a non-slip texture. Other materials, like wood or metal decking, may be possible for use in areas where concrete construction is infeasible, subject to approval by the City Engineer.

There should be a 1.8 m (6'-0") landing area the width of the stairs at the top or bottom of the stair, constructed from concrete. This landing should also be repeated for every 3.6 m (12'-0") of rise. The maximum slope in these landing areas should be 1:50 in any direction. These landings will provide a firm, level surface at the top or bottom of stairs for people to safely access the stair from the connector, and will also provide resting places along the way up and down the stair.

D3 The Design and Implementation of Alternative Pathways along Roadways

Alternative pathways are intended to be interim improvements for city arterial streets where it is anticipated that a full urban standard will not be built in the near future, if at all. These guidelines will allow the city to install some level of improvement for pedestrians without bearing the expense of an almost complete reconstruction of the street, which current standards suggest.

There are two primary types of alternative pathways along roadways that have been defined for the purposes of these guidelines: separated pathways and widened shoulder pathways. Each type has unique characteristics that require a different design approach. However, it is highly unlikely that in the design of a pathway, any one approach will be sufficient, and the end product will most likely be a combination of various types of widened shoulder and/or separated pathway treatment.

Each of these two types are explained in more detail later in this section.

[7] City of Portland Standard Construction Specifications, Standard Plan Nos. 3-171 and 3-172.

D3.1 Application of Alternative Pathways along Roadways

In defining when and where to use the various pathway approaches defined in the guidelines, a hierarchy of treatments and materials was developed to help guide development of pathways throughout the City. As diagrammed in the adjacent figure, different pathway and material treatments fall on a continuum of most to least preferred. The most preferred treatment is the City standard, which requires a concrete sidewalk separated physically from the roadway by a concrete curb and, preferably, a planting or furnishing zone.

Other treatments are allowed, but not preferred to the current City standard. **These alternative treatments are not intended for use to fulfill development requirements for street improvements.**

In cases where an alternative pathway solution is used, some treatments, like separated pathways, are preferable to others, such as widened shoulders, because of the physical separation provided between the pedestrian and traffic. Additionally, vertical separation such as curbs may be preferred over horizontal separation.

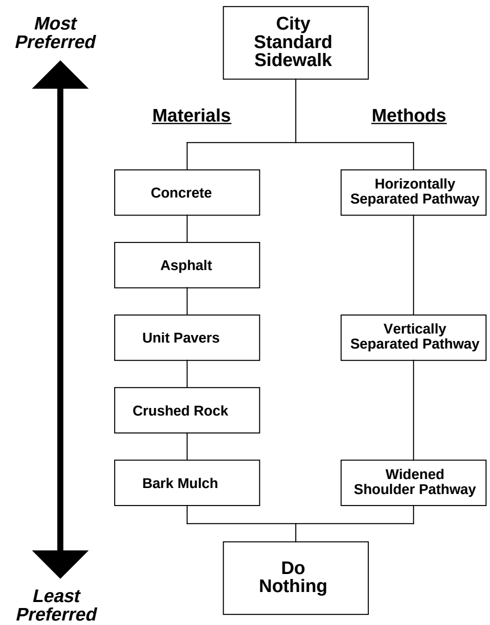
Selecting a preferred treatment for pathway development must be predicated on a number of different criteria, including, but not limited to:

Safety -*What is the 85th percentile speed of the traffic on the adjacent roadway? What is the sight distance? Is the path location on a curve? Are there areas for the pedestrian to escape an oncoming vehicle?*

Durability -*Is the proposed treatment and material durable enough to continue to provide a firm, level walking surface over an extended amount of time?*

Maintenance -*Is the proposed treatment easily maintained? Is the property owner or the City responsible for maintenance of the pathway? Can a property owner either maintain the improvement or hire someone to maintain the improvement?*

Amount of Use -*How many pedestrians are likely to use the new pathway?*



Hierarchy of preferred alternative pathway treatments.

A separated alternative pathway may take the form of a boardwalk, as in this example on SW Greenway.

Impact -*What impact will pathway construction have on significant existing features like storm drainage, parking and vegetation?*

Community Design -*How does the pathway improvement fit within the neighborhood environment and respond to community desires?*

Accessibility -*Is the proposed pathway the only reasonably direct pedestrian route for walking trips or are there other options for pedestrians?*

Cost -*Does the proposed alternative path treatment cost less to design, construct and maintain than the current City standard?*

D3.2 Separated Alternative Pathways along Roadways

Separated pathways are those pathways that are physically separated from the roadway either horizontally (e.g., with a ditch or swale), vertically (e.g., a wall or curb), or both. In general, this pathway type most closely mirrors the existing city standard sidewalk, which calls for the vertical separation of a curb and preferably the horizontal separation of a planting strip or furnishing zone.

The pathway tools recommended in Table D-1 have some common characteristics. These characteristics include the potential for using materials other than concrete and the provision of physical separation for the pedestrian, adding to the level of comfort and sense of security.

Taken together, the potential to respond to a varying range of site specific conditions can be found within the toolbox of solutions listed here and in the Widened Shoulder descriptions. In fact, most pathway solutions will require a combination of these concepts to respond to site specific conditions and address issues such as safety, drainage, and accessibility.

Each of the solutions presented in Table D-1 lists a comparative cost of construction and a list of appropriate materials. The costs are provided to help understand how the solutions compare to each other and to a City standard sidewalk. Depending on existing site conditions, a City standard sidewalk (which for the purposes of this Guide includes a concrete curb, 1.8 m [6'-0"] wide concrete sidewalk and general stormwater system) can run anywhere from $240/lin m ($74/lin ft) to $550/lin m ($167/lin ft).

D3.3 Widened Shoulder Pathways

Widened shoulder pathways provide an alternative to separated pathways where physical space within the right-of-way is limited by features such as steep slopes, existing vegetation or significant structures. By providing a wider area at the side of the road for pedestrians to use, this type of pathway can usually be constructed around the existing drainage facilities using roadway construction methods.

Some advantages of widened shoulder pathways include minimal impact on existing right-of-way features; maintenance as part of routine roadway maintenance by the City (for arterial streets); and the potential to widen the roadway for use by bicycles as well.

Widened pathway solutions must be applied carefully to ensure that the end result is a net increase in safety for pedestrians over the existing condition. **For this reason, widened shoulders are seen as the least preferable of pedestrian facility options, and should be used only when other alternatives are not practicable.**

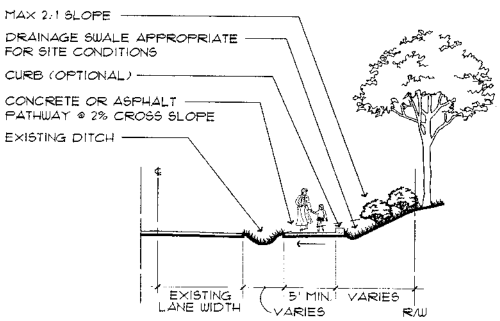
As with the guidelines for separated pathways, each of the widened shoulder solutions outlined in Table D-1 has a list of recommended materials and comparative cost. The costs are provided to help understand how these solutions compare to each other and to a City standard sidewalk.

A widened shoulder on SW Sunset Blvd. might be an improvement over the current lack of any pedestrian facility, but widened shoulders remain the least preferred option for pedestrian facilities, to be considered only when other alternatives are not practicable.

Table D-1
Alternative Pathway Concepts

Separated Pathway Types

Separated Pathway with Swale



Separated Pathway with Swale

Purpose: Provide separation between pathway and travel lanes by using a swale to convey stormwater.

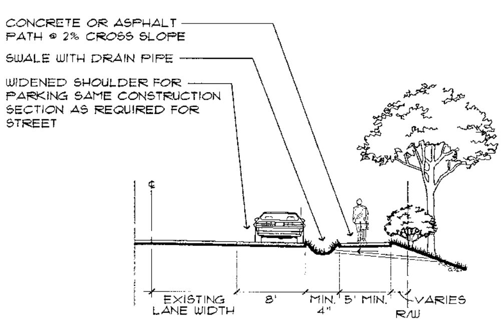
Where to use: Reasonably flat areas where on-street parking is not in high demand or necessary; adequate R.O.W is required.

Guidelines:
- Adequate space is required (2.4-3.0m [8-10 feet]) and swale should be planted with grass if it is to be used for water quality.
- Pathway should slope towards planting strip.
- Street trees would not be allowed in swale.
- Short culvert runs will be required at driveway crossings.
- Short curb and/or swale at back of walk may be necessary to keep water and debris off of pathway.

Possible materials for use:
- Concrete (preferred)
- Concrete/Asphalt Unit Pavers (acceptable)
- Asphalt (acceptable in undeveloped R.O.W. or public walkway easements)
- Crushed Rock (acceptable in undeveloped R.O.W./public walkway easements where other accessible and reasonably direct routes are available)

Comparative cost: $92/lin m ($28/lin ft)

Separated Pathway with Swale or Planting Strip and On-Street Parking



Separated Pathway with Swale or Planting Strip and On-Street Parking

Purpose: Provide separation between pathway and travel lanes by using a planting strip/swale without curbing.

Where to use: Reasonably flat areas where on-street parking is required; adequate R.O.W is required.

Guidelines:
- Some depression of the planting strip may be required to convey water away from private property.
- Pathway should slope towards planting strip.
- Street trees are encouraged in the planting strip. Care must be taken to provide adequate protection from cars. Trees in this area should be installed at a minimum of 100mm (4 inch) caliper. Low growing (under 750mm [30 in]) vegetation is encouraged where appropriate.
- On-street parking must be accommodated on roadway and not allowed on planting strip.

Possible materials for use:
- Concrete (preferred)
- Concrete/Asphalt Unit Pavers (acceptable)
- Asphalt (required for roadway widening; acceptable for path in undeveloped R.O.W. or public walkway easements)
- Crushed Rock (acceptable in undeveloped R.O.W./public walkway easements where other accessible and reasonably direct routes are available)

Comparative cost: $124/lin m ($39/lin ft)

Separated Pathway on Fill or Wall, with Swale

Purpose: Provide separation between pathway and travel lanes by building up a level area for the pathway and using a swale to convey stormwater.

Where to use: Downhill side of roadway where preserving existing vegetation or other features is desired or where inadequate space for grading is available; adequate R.O.W is required.

Guidelines:
- Adequate space is required (2.4-3.0m (8-10 feet)) and swale should be planted with grass if it is to be used for water quality.
- Pathway should slope towards swale.
- Street trees would not be allowed in swale.
- Railing may be required at back of walk, depending on wall height.

Possible materials for use:
- Concrete (preferred)
- Concrete/Asphalt Unit Pavers (acceptable)
- Asphalt (acceptable in R.O.W. or public walkway easements)
- Crushed Rock (acceptable in undeveloped R.O.W./public walkway easements where other accessible and reasonably direct routes are available)
- Concrete, Rock, Masonry, or Keystone Type Units (acceptable for wall)

Comparative cost: $272/lin m ($ 83/lin ft)

Separated Pathway Below Road Grade

Purpose: Provide separation between pathway and travel lanes by providing a level area on the downhill side of the roadway.

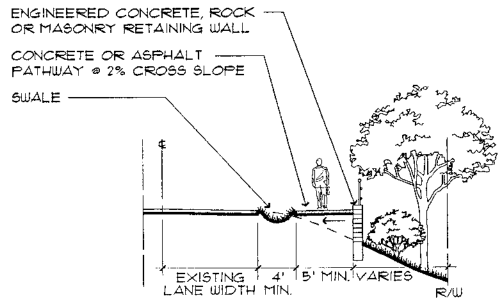
Where to use: Areas where a path is desired on the downhill side of the road and walls are not desired or required or where holding street grade would destroy existing features; areas where significant vegetation adjacent to the roadway is to be maintained; adequate R.O.W is required.

Guidelines:
- Pathway should be no more than 1.2m (4 feet) below road grade in order to ensure visibility to and from the path.
- Pathway may need to drain towards adjacent property or to swale on roadway side of path.
- Trees and other vegetation should be encouraged in the area between pathway and road. Maintain good visibility between path and road to provide a sense of security.
- Pathway may need to come back to road grade for driveway crossings.
- Guardrail may be required at edge of roadway depending on steepness of side slope and/or roadway alignment.

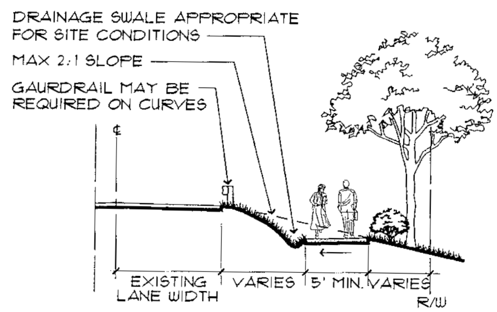
Possible materials for use:
- Concrete (preferred)
- Concrete/Asphalt Unit Pavers (acceptable)
- Asphalt (acceptable in undeveloped R.O.W. or public walkway easements)
- Crushed Rock (acceptable in undeveloped R.O.W./public walkway easements where other accessible and reasonably direct routes are available)

Comparative cost: $80/lin m ($24/lin ft)

Table D-1
Alternative Pathway Concepts, continued

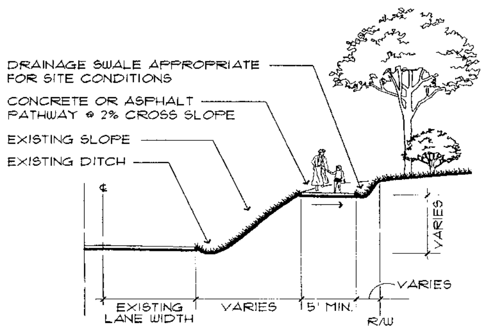


Separated Pathway on Fill or Wall, with Swale



Separated Pathway below Road Grade

Table D-1
Alternative Pathway Concepts, continued



Separated Pathway Above Roadway

Separated Pathway Above Road Grade

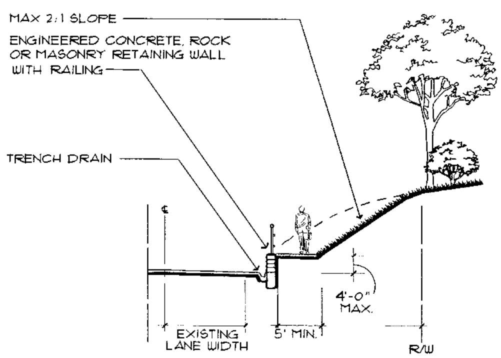
Purpose: Provide separation between pathway and travel lanes by providing a level area on the uphill side of the roadway.

Where to use: Areas where a path is desired on the uphill side of the road and walls are not desired or required or where holding street grade would destroy existing features; areas where significant vegetation adjacent to the roadway is to be maintained; adequate R.O.W is required.

Guidelines:
- Pathway should be no more than 1.8m (6 feet) above road grade in order to ensure visibility to and from the path.
- Pathway should drain towards roadway. If bank erosion is a concern, a swale on the backside of the pathway could convey water instead.
- Trees and other vegetation should be encouraged in the area between pathway and road. Maintain good visibility between path and road to provide a sense of security.
- Pathway may need to come back to road grade for driveway crossings.

Possible materials for use:
- Concrete (preferred)
- Concrete/Asphalt Unit Pavers (acceptable)
- Asphalt (acceptable in R.O.W. or public walkway easements)
- Crushed Rock (acceptable in undeveloped R.O.W./public walkway easements where other accessible and reasonably direct routes are available)

Comparative cost: $42/lin m ($13/lin ft)



Separated Pathway on Wall

Separated Pathway on Wall

Purpose: Provide separation between pathway and travel lanes by building a pathway on top of a wall on the uphill side of the roadway.

Where to use: Areas where a path is desired on the uphill side of the road but where inadequate space exists to separate the path horizontally from the roadway; areas with significant vegetation and slopes near the roadway.

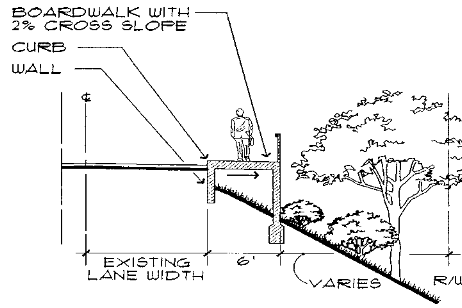
Guidelines:
- Pathway should be no more than 1.2m (4 feet) above road grade in order to ensure visibility to and from the path.
- Pathway should drain towards roadway.
- Railing will be required on top of wall; refer to illustration
- Pathway will need to come back to road grade for driveway crossings.
- Wall creates a curbed situation; use for short sections (under 30m [100 feet]) or collect stormwater and convey it to a standard storm system.

Possible materials for use:
- Concrete (preferred)
- Concrete/Asphalt Unit Pavers (acceptable)
- Asphalt (acceptable in R.O.W. or public walkway easements)
- Crushed Rock (acceptable in undeveloped R.O.W./public walkway easements where other accessible and reasonably direct routes are available)
- Concrete, Rock, Masonry, or Keystone Type Units (acceptable for wall)

Comparative cost: $343/lin m ($105/lin ft)

Separated Pathway on Boardwalk
Purpose: Provide vertically separated pathway over difficult slope areas by building a wooden structure to support a boardwalk.
Where to use: Short segments where existing conditions make it impossible and potentially more expensive to provide a pathway on grade.
Guidelines: • Separate boardwalk from roadway with a standard concrete curb. • Curb concentrates stormwater; use this solution for short sections (under 30m (100 feet)) or collect stormwater and convey it to a standard storm system. • Railing will be required at back of path. • Driveway crossings require standard concrete apron. • Non-skid surfaces are preferred to wood decking to prevent slipping on a wet or leaf-covered pathway.
Possible materials for use: • Treated Lumber • Non-skid Metal Decking
Comparative cost: $1115/lin m ($340/lin ft)

Table D-1
Alternative Pathway Concepts, continued

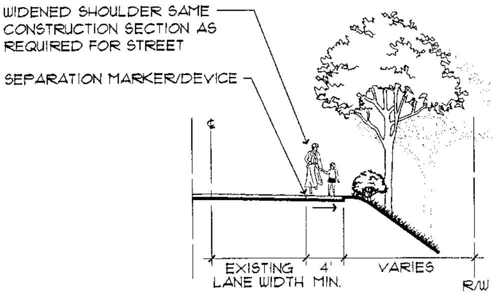


Separated Pathway on Boardwalk

Table D-1
Alternative Pathway Concepts, continued

Widened Shoulder Pathway Types

Widened Shoulder



Widened Shouler

Purpose: Provide widened shoulder for additional walking space at side of roadway.

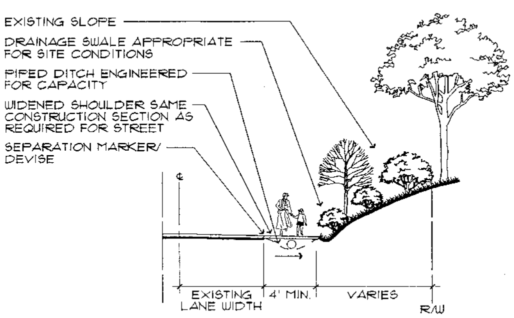
Where to use: Areas where site conditions (topography, vegetation, or significant structures) do not allow a separated pathway to be installed.

Guidelines:
- Minimum width is 1.2m (4 feet) although a wider area may be required depending on issues like traffic speed, roadway curves, and amount of use.
- Widened area must meet structural cross section of adjacent roadway.
- Finished asphalt surface should be as smooth as possible to accommodate bikes, wheelchairs, strollers, and other similar vehicles.
- Clear signage and markings are required for widened shoulders to restrict parking from pathway area.
- Raised 4" buttons, guardrails, or a standard curb and sidewalk may be required in areas where safety issues such as speed, sight distance or roadway alignment dictate additional safety measures.

Possible materials for use:
- Asphalt (Required for widened shoulder)
- 3M Stamark tape or equivalent at edge of roadway (for detectable separation)
- Raised 4" buttons (optional)

Comparative cost: $65/lin m ($20/lin ft)

Widened Shoulder with Culvert



Widened Shouler with Culvert

Purpose: Provide widened shoulder for additional walking space at side of roadway and accommodate drainage in culvert underneath.

Where to use: Areas where a widened shoulder would replace an existing open drainage ditch or swale.

Guidelines:
- Length of culvert should be limited to 30m (100 feet).
- Minimum width is 1.2m (4 feet) although a wider area may be required depending on issues like traffic speed, roadway curves, and amount of use.
- Widened area must meet structural cross section of adjacent roadway.
- Finished asphalt surface should be as smooth as possible to accommodate bikes, wheelchairs, strollers, and other similar vehicles.
- Clear signage and markings are required for widened shoulders to restrict parking from pathway area.
- Raised 4" buttons, guardrails, or a standard curb and sidewalk may be required in areas where safety issues such as speed, sight distance or roadway alignment dictate additional safety measures.

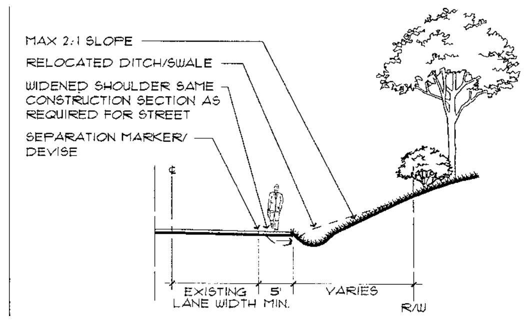
Possible materials for use:
- Asphalt (Required for widened shoulder)
- 3M Stamark tape or equivalent at edge of roadway (for detectable separation)
- Raised 4" buttons (optional)

Comparative cost: $135/lin m ($41/lin ft)

Widened Shoulder with Ditch or Swale

Purpose: Provide widened shoulder for additional walking space at side of roadway, with existing ditch/swale moved to new edge of roadway.
Where to use: Areas where site conditions (topography, vegetation, or significant structures) do not allow a separated pathway to be installed and where adequate space exists to provide a ditch or swale at the new edge of roadway.
Guidelines: • Consider moving path to back side of swale as preferred option. • Ditch/swale will require culvert at driveway crossings. • Minimum width is 1.2m (4 feet) although a wider area may be required depending on traffic speed, roadway curves, and amount of use. • Widened area must meet structural cross section of adjacent roadway. • Finished asphalt surface should be as smooth as possible to accommodate bikes, wheelchairs, strollers, and other similar vehicles. • Clear signage and markings are required for widened shoulders to restrict parking from pathway area. • Raised 4” buttons, guardrails, or a standard curb and sidewalk may be required in areas where safety issues such as speed, sight distance or roadway alignment dictate additional safety measures.
Possible materials for use: • Asphalt (Required for widened shoulder) • 3M Stamark tape or equivalent at edge of roadway (for detectable separation) • Raised 4” buttons (optional)
Comparative cost: $75/lin m ($23/lin ft)

Table D-1
Alternative Pathway Concepts, continued



Widened Shoulder with Ditch or Swale

Note: *The widened shoulder is the least preferred option for pedestrian facilities, to be considered only when other alternatives are not practicable.*

A shared pedestrian and bicycle pathway along the Willamette River serves both transportation and recreation purposes.

Concrete

Where to Use: Preferred material for use on sidewalks or on alternative pathways separated from the road by a curb and/or planting strip or swale. Not for use as a material for widened shoulder alternative pathways.	
Construction Technique: 100 mm (4 inches) of 23 MPa (3300 psi) Portland cement concrete on compacted subgrade; 100 mm (4 inches) of compacted aggregate can also be used as a base where needed.	
Property Owner Maintenance: Relatively easy to maintain, either by property owner or by hired contractor.	
Maintenance Life: 75 years plus.	
Comparative cost: $35.00/sq m ($29.25/sq yd)	
20 year cost: $9.33/sq m ($7.80/sq yd)	

Asphalt

Where to Use: Preferred material for use on any widened shoulder alternative pathway. Acceptable but not preferred as a material for separated alternative pathways or connector paths. Unacceptable for use for City standard sidewalk.	
Construction Technique: 100 mm (4 inches) of asphalt concrete in two 50 mm (2 inch) lifts on 100 mm (4 inches) of compacted aggregate base.	
Property Owner Maintenance: The City will be responsible for maintaining widened shoulders. For separated pathways, asphalt is fairly difficult to maintain for a property owner since hot mix asphalt is required for patching.	
Maintenance Life: 40 years plus.	
Comparative cost: $30.00/sq m ($25.00/sq yd)	
20 year cost: $15.00/sq m ($12.50/sq yd)	

Concrete Pavers

Where to Use: Acceptable material for use on sidewalks, in the Furnishings Zone, and on alternative pathways separated from the roadway by a curb and/or planting strip or swale. Not for use as a material for widened shoulder alternative pathways.	
Construction Technique: Concrete unit pavers (varying size) on 25 mm (1 inch) of sand and 100 mm (4 inches) compacted aggregate base; pavers to be placed hand tight and the joints swept with sand. Alternatively, pavers can also be set on a 25 mm (1 inch) mortar bed, either hand tight or with mortared joints. Geotextile fabric is recommended between the aggregate base and the sand layer.	
Property Owner Maintenance: Relatively easy to maintain, either by property owner or by hired contractor.	
Maintenance Life: 20 years plus.	
Comparative cost: $60.00/sq m ($50.00/sq yd)	
20 year cost: $60.00/sq m ($50.00/sq yd)	

Crushed Rock
Where to Use: Acceptable material for use on any connector that is not a continuous passage. Limited use for horizontally separated pathways along roadways with low traffic volumes and no on-street parking. Unacceptable for use as a widened shoulder material or as part of a City standard street improvement.
Construction Technique: 50 mm (2 inches) of 6 mm minus (1/4 inch minus) compacted aggregate over 100 mm (4 inches) of 19 mm minus (3/4 inch minus) compacted aggregate; geotextile fabric is recommended below the aggregate to limit weed growth. Compact material to create firm, smooth walking surface.
Property Owner Maintenance: Relatively easy to maintain, either by property owner or by hired contractor.. Will require continuous ongoing maintenance if the intent is to provide an ADA compliant walking surface.
Maintenance Life: 5 years plus
Comparative cost: \$10.00/sq m (\$8.40/sq yd)
20 year cost: \$40.00/sq m (\$33.60/sq yd)

Bark Mulch
Where to Use: Acceptable material for use on any connector that is not a continuous passage. Unacceptable for use along a vehicular way or as part of a City standard street improvement.
Construction Technique: 100 mm (4 inches) of bark mulch on compacted subgrade; geotextile fabric beneath the mulch is recommended to limit weed growth. Compact material to create firm, smooth walking surface.
Property Owner Maintenance: Relatively easy to maintain, either by property owner or by hired contractor. Will require continuous ongoing maintenance if the intent is to provide an ADA compliant walking surface.
Maintenance Life: 2 years plus.
Comparative cost: \$5.00/sq m (\$4.20/sq yd)
20 year cost: \$50.00/sq m (\$42.00/sq yd)

Glossary

A

Accessible route - in the ADA, a continuous route on private property that is accessible to persons with disabilities. There must be at least one accessible route linking the public sidewalk to each accessible building. See also "Continuous path."

Actuated signal - a signal where the length of the phases for different traffic movements is adjusted for demand by a signal controller using information from detectors.

ADA - Americans with Disabilities Act of 1990; broad legislation mandating provision of access to employment, services, and the built environment to those with disabilities.

Alternative Pathway - a design for a pedestrian facility along a roadway that is an alternative to an urban standard sidewalk with curb.

Arterial Street - any street with the ASCP Traffic Classification of Neighborhood Collector or higher in the Transportation Element.

ASCP - Arterial Streets Classifications and Policies; the City of Portland's policies for appropriate use of the right-of-way for each mode on every street as embodied in the Transportation Element of the Comprehensive Plan.

Attached sidewalk - a sidewalk with one edge adjacent to the back of the street curb. An attached sidewalk may or may not have intermittent planting of street trees in wells along its length.

Audible pedestrian signals - pedestrian signal indicators that provide an audible signal to assist visually impaired pedestrians in crossing the street.

B

BOM - Bureau of Maintenance (Portland Office of Transportation).

BTM - Bureau of Traffic Management (Portland Office of Transportation).

BTED - Bureau of Transportation Engineering (Portland Office of Transportation).

C

City Walkway - pedestrian classification for the Transportation Element of the Comprehensive Plan. In 1996 this classification replaced the classifications "Pedestrian Path" and "Pedestrian Path with Crossings." City Walkways are intended to provide safe, convenient and attractive pedestrian access to activities along major streets, to provide connections between neighborhoods, and to provide access to transit and recreational and institutional destinations.

Clearance interval - the length of time that the DON'T WALK indication is flashing on a pedestrian signal indication.

Comprehensive Plan - a broad collection of goals, policies, and objectives adopted by the Planning Commission and City Council of Portland that is intended to inspire, guide, and direct growth in the City.

Connector pathway - a walkway, trail, stair or other pedestrian facility not situated along a street. This may occur as a pathway within a public right-of-way where no street has been built, in a public walkway easement on private property, or as a path in a park or other open space.

Continuous path - in the ADA, a continuous, unobstructed pedestrian circulation path within a public sidewalk connecting pedestrian areas, elements and facilities in the public right-of-way to accessible routes on adjacent sites. The continuous path is similar to the "Accessible route" on private property, but is subject to different guidelines.

Crossing treatment - a physical treatment of a crosswalk to make it safer and more convenient for pedestrian travel; may include such elements as crosswalk markings, median refuges, or curb extensions.

Cross slope - the slope of the sidewalk across the usual line of travel.

Crosswalk - any portion of a roadway at an intersection or elsewhere that is distinctly indicated for pedestrian crossing. Where there are no pavement markings, there is a crosswalk at each leg of every intersection, defined by law as the prolongation or connection of the lateral lines of the sidewalks.

Cul-de-sac - a street closed at one end.

Curb extension - an area where the sidewalk and curb are extended into the parking lane, usually in order to shorten pedestrian crossing distance. Also called “bulb-out” or “curb bulb”.

Curb radius - the length of the radius of the curve where a curb turns a street corner.

Curb ramp - a combined ramp and landing to accomplish a change of level at a curb in order to provide access to pedestrians using wheelchairs.

Curb Zone - the portion of the Sidewalk Corridor that physically separates the sidewalk from the roadway.

D

Detached sidewalk - a sidewalk that is separated from the curb by a linear planting strip. (see Separated sidewalk.)

Dropped landing - accessibility element in which the sidewalk ramps down to a landing at street level. Used only in constrained circumstances where a standard curb ramp can’t be accommodated.

F

Fixed-time signal - a signal that operates on a regular fixed cycle and has no actuated phases.

Frontage Zone - a linear portion of the Sidewalk Corridor, adjacent to the edge of the right-of-way (or property line).

Fully-actuated signal - a signal where all signal phases are actuated. (See “Actuated signal.”)

Furnishings Zone - a linear portion of the Sidewalk Corridor, adjacent to the curb that contains elements such as street trees, signal poles, utility poles, street lights, controller boxes, hydrants, traffic signs, street signs, parking signs, parking meters, driveway aprons, planting strip, or street furniture.

G

Grade separation - the separation of a pedestrian facility from facilities for vehicular movement by placing the facilities at different vertical elevations. Examples include pedestrian overpasses and underpasses.

Intersection - the area of a roadway created when two or more public roadways join together at any angle.

L

Landing - the level area at the top (or bottom) of a curb ramp.

Local Service Walkway - pedestrian classification in the Transportation Element of the Comprehensive Plan. Local Service Walkways are intended to provide safe and convenient access to local destinations such as residential neighborhoods.

All streets and rights-of-way not classified as City Walkways or Pedestrian Districts, with the exception of limited access highways, would be classified as Local Service Walkways.

Local Streets - streets with the ASCP Traffic Classification of Local Service Street.

M

Main Street Pedestrian Design area - a design overlay on a City Walkway applied where pedestrian use and desired design treatment are similar to a Pedestrian District.

Median refuge island - a refuge island located between vehicle travel lanes.

Midblock crossing - a crossing treatment that occurs between intersections.

MUTCD - Manual on Uniform Traffic Control Devices, a publication of the Federal Highway Administration that establishes a national standard for traffic control.

O

Obstruction-free Area - at a street corner, the space between the curb and the lines created by extending the property line (or the line of a public walkway easement) to the curb face, in which no obstructions to pedestrian movement should be located.

Off-Street Path - pedestrian classification in the Transportation Element of the Comprehensive Plan. In 1996, this classification replaced the classification "Recreational Trail." It applies to paths and trails in areas not served by the street system, such a parks and greenbelt corridors. Off-street paths are intended to serve both recreational uses and other trips, and may accommodate other non-motorized travel modes in addition to walking.

P

Parallel curb ramp - ADA term for the element described in this guide as a "dropped landing," in which the sidewalk ramps down to a landing at street level. Used only where constraints prevent accommodating a standard curb ramp.

Parking control - the use of meters, signs or curb markings to indicate where parking is and is not allowed.

Pathway- a pedestrian walkway other than a standard sidewalk.

Pedestrian - according to Portland's City Code, "a person afoot; a person operating a pushcart; a person riding on, or pulling a coaster wagon, sled, scooter, tricycle, bicycle with wheels less than 14 inches in diameter, or a similar conveyance, or on roller skates, skateboard, wheelchair or a baby in a carriage."

Pedestrian District - districts characterized by dense mixed-use development with a concentration of pedestrian-generating activities. These districts are identified and classified in the Transportation Element to insure that improvements in the right-of-way provide for the ease of pedestrian movement through the use of appropriate design treatments.

Pedestrian signal indication - the lighted WALK/DON'T WALK (or walking man/hand) signal that indicates the pedestrian phase.

Perpendicular curb ramp - ADA term for a curb ramp in which the slope of the ramp is generally perpendicular to the line of the curb. This guide uses the term "curb ramp" to refer to such elements. See also "Parallel curb ramp" and "Dropped landing."

Public stair - a public facility of more than three steps, either in public right-of-way or a public walkway easement, for the use of the public.

Public walkway easement - an easement granted by a property owner to the City for the purpose of providing public access to pedestrians. Construction and maintenance of the sidewalk or walkway facilities in the easement is the responsibility of the adjacent property owner, just as it is with walkways in the right-of-way.

R

Refuge island - a raised island in the roadway that separates a crosswalk into discrete legs and provides a refuge for crossing pedestrians.

Right-of-way - an easement held by the City over land owned by the adjacent property owners that allows the City to exercise control over the surface and above and below the ground of the right-of-way. Property owners are typically responsible for the construction of transportation improvements adjacent to their property. The City maintains the street, while the property owner is responsible for maintaining the sidewalk.

ROW - see "Right-of-way."

Running grade - the slope of the sidewalk or roadway along the line of travel.

S

Semi-actuated signals - signals where only some phases (usually the side street) are actuated. (See "Actuated signals.")

Separated sidewalk - a sidewalk separated from the curb by linear planting strip which may include lawn or groundcover and street trees. (see "Detached sidewalk.")

Sidewalk - an improved facility intended to provide for pedestrian movement; usually, but not always, located in the public right-of-way adjacent to a roadway. Typically constructed of concrete (see Standard Construction Specifications Section 308).

Sidewalk Corridor - the area located within the public right-of-way between the curb line of a street or roadway edge and the property line at the edge of right-of-way.

Slip lane - a lane provided for ease of right-hand turns at the intersection of arterial streets. In new construction, this is often accomplished by the use of a large turning radius and an intermediate refuge island for pedestrian crossings.

Splinter island - used to separate opposing lanes of traffic at the throat of a modern roundabout intersection treatment.

Street vacation - the process of vacating the public right-of-way, the control of which reverts to the underlying property owners unless the City retains a Public Walkway Easement.

T

Tactile warning - a surface treatment, usually at a curb ramp or any unexpected edge such as a rail platform, that can be detected with a cane by a person with vision impairment.

"T" intersection - an intersection where one street ends at a through street, forming an intersection shaped like the letter "T".

TE - Transportation Element of the Comprehensive Plan for the City of Portland. (See "ASCP.")

Through Pedestrian Zone - a linear portion of the Sidewalk Corridor which contains no obstructions, openings, or other impediments that would prevent or discourage movement by pedestrians.

Transit street - a street that is classified as a Major City Transit Street or a Minor City Transit Street in the ASCP of the TE. Land-use regulations on transit streets require buildings oriented toward the street and encourage building close to the lot line.

Vacation - see "Street Vacation."

W

Walkway - a pedestrian facility, whether in the public right-of-way or on private property, which is provided for the benefit and use of the public.

Widened shoulder - a pedestrian facility provided immediately adjacent to the roadway.

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